April 1983

Incorporating Spectrum User

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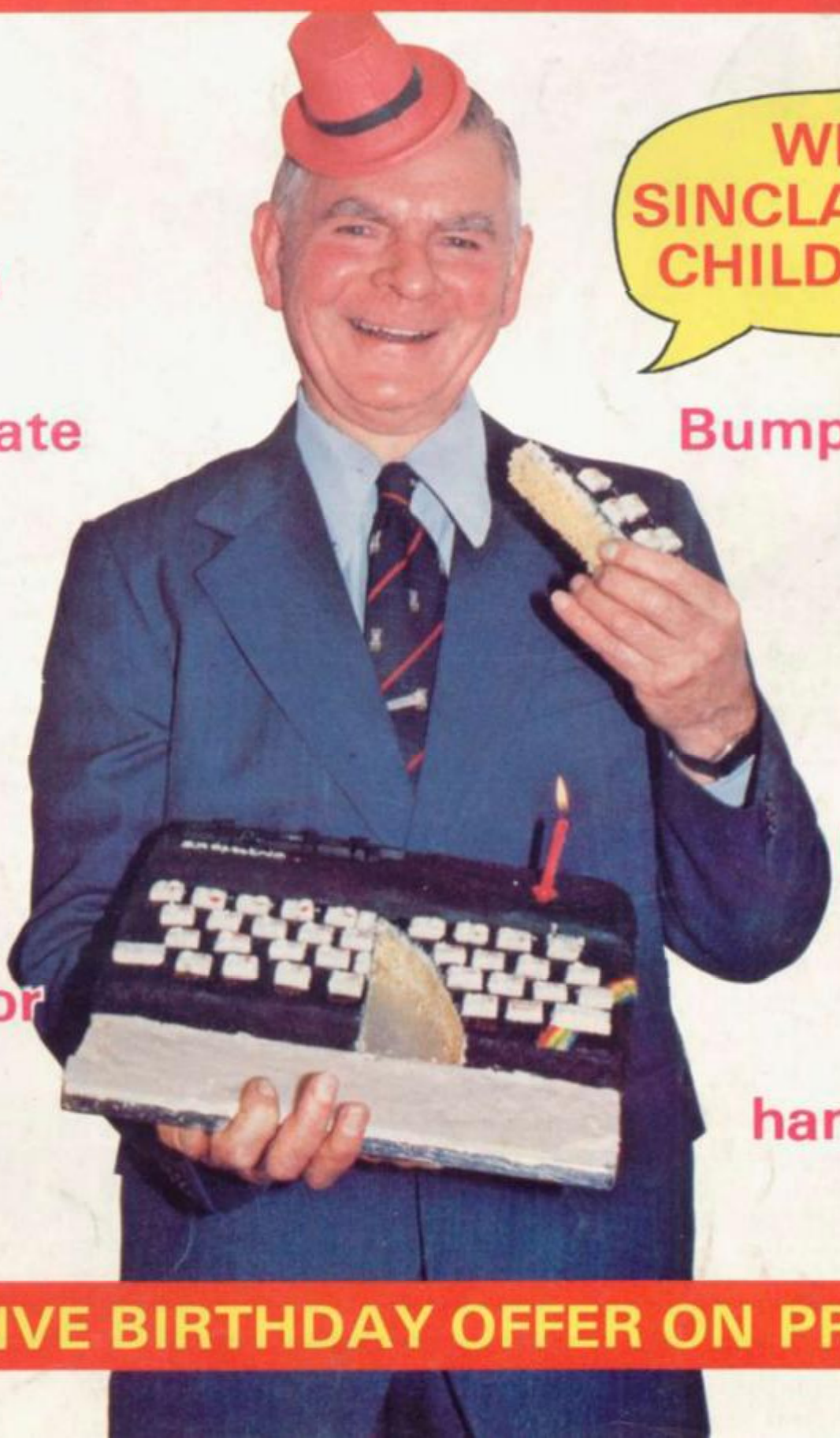

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If you would like to contribute to any of the Sinclair User group of publications please send programs, articles or ideas for hardware projects to:
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London N1 8BJ

Programs should be on cassette and articles should be typed. We cannot undertake to return them unless a stamped-addressed envelope is included.
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NEXT MONTH

John Gilbert completes his series on programming for beginners and considers some of the other computer languages which can now be put on Sinclair machines. Stephen Adams reviews the graphics board from DK'tronics.

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MELBOURNE HOUSE PUBLISHERS

A year ago this month

A YEAR AGO the first issue of *Sinclair User* was published to meet the demand from a growing number of owners of Sinclair ZX-80 and ZX-81 machines. As it was a new market, the first moves were cautious and only 32,000 were printed of that first issue. It sold out and the success of *Sinclair User* was assured.

We thought of marking our first anniversary with a special magazine but then realised that the formula which had made us successful should be disturbed only for an especially major event. Though our first birthday is important, it is not important enough to stop the regular flow of news, views and reviews.

Thus we have limited its mention to the columns of Sinclairvoyance and a special anniversary offer on the price of the ZX printer, details of which can be seen on page 67.

We have taken the opportunity, however, to change the style of presentation of articles. We have done so because, despite the increasing size of the magazine, important items have still had to be omitted or postponed because of the lack of space. The new format will allow us to put more information on to each page.

During our first year we received many complimentary comments from readers and advertisers. From the large number

of letters we can quote from only a few but typical of the things you have had to say about us are those printed here.

Derek Reid from Dublin writes: "I must congratulate you on publishing such a good magazine. The articles are very interesting and the reviews and programs are excellent."

Sheldon Kenton of Whyteleafe, Surrey had this to say: "Before I had my ZX-81 I had already been buying *Sinclair User* for three issues and was very impressed with what I saw. I also found your Starting from Scratch articles extremely useful".

Our advertisers similarly have been keen to express their appreciation.

"Our recent advertisements in *Sinclair User* have proved so successful that I have now shelved all plans for advertising in any other magazine," was the view of Bob Benchley of R and R Software.

Dave Looker of DJL Software made the following comment: "I never cease to be amazed by the world-wide coverage provided by your magazine."

Finally Nigel Searle, managing director of Sinclair Research had this to say. "As reflected by the extraordinary growth in its circulation *Sinclair User* has met a significant need among our customers for a constant flow of product information and applications and, on its first anniversary, we wish it continued growth and success."

We have, of course, had our critics, particularly about the program listings. Since obtaining our dot matrix printer we have improved the listings for the ZX-81 programs and we will be doing the same for the Spectrum when a Centronics interface is available.

All the other criticisms are examined and we are always interested to consider ways of improving our service to readers. Our most recent recruits have been Quentin Heath and Zak. Heath has taken over the Mind Games column from Philip Joy and Zak draws our cartoon strip, Sinclair Simon. Both are interested in hearing your views.

There have been many changes in the Sinclair market during our first year, all of them connected with the growing popularity of home computing and the leading position of the Sinclair machines. Many of the small companies which began providing software and hardware add-ons as a sideline have found business so good that they have started doing the work full-time and are finding ever more complicated ways of using the deceptively small machines.

Sinclair User has been recording those changes and trying to reflect the wide demands of a market which is becoming increasingly sophisticated. We think the mix of programs, news of new products and the latest developments in the market, along with advice on how to obtain the most from your machine and items of general interest, is about correct.

We are concerned, however, to improve the service we can offer and decided to set up the *Sinclair User* Road Show. It will

be based on the usual stand we have had a number of shows in the last year, at which we have sold magazines and displayed some of the games we have published.

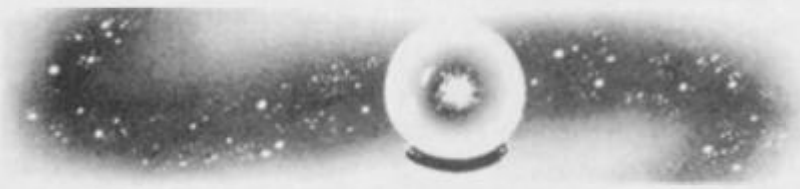
The major addition will be a series of problem-answering sessions by some of our contributors. Readers will be able to visit us with their difficulties, be they hardware or software, and we will give any advice we can.

We shall be testing the idea at the Bristol Hobbyist Fair being held on Saturday, March 19.

On the wider Sinclair market it is doubtful if our second year will be dominated by one event in the way that the Spectrum dominated our first. Despite having launched a new computer in each of the last three years, it is unlikely that Sinclair Research will follow that again this year.

The planned portable machine is not expected to be ready until next year, when the technology of the flat-screen television and the Microdrive will have been fully tested. One possible expansion is that the machine being developed for the U.S. market, the TS 1500, an improved ZX-81, might be sold here.

Of more immediate interest is the long-awaited Microdrive. As mentioned in our news pages, it has been further delayed. Early April is the latest date which was being talked about but



that is already three months behind the original final date given when it was first announced last April.

It is understood that the latest problem relates to the type of tape being used. It is thought that the original tape which was believed to be suitable has shown signs of stretching.

No doubt this year there will be a number of competitors arriving. The Oric is already here and appears to be doing well, along with the Dragon. As for the others, we shall wait and see if they can begin production in the numbers necessary to provide a real challenge to the established leader.

In the meantime, we promise to continue to provide all the information you want on the Sinclair scene.

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If on the other hand you've already got the Top Ten then why not come in and browse through the rest of our range.

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(all 16K programs will run on 48K machines)

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This month's offer includes a wide variety of cassettes covering sport and adventure

Save 30 percent on top games programs

THE CLUB OFFER this month consists of a variety of games ranging from arcade action to graphics simulations of popular sports and space adventure.

The software house R and R started several months ago as a small company selling games which run on the ZX-81. At first it advertised in the Supermarket section of *Sinclair User* but when it began to sell Spectrum games it struggled to keep pace with orders.

With the release of **Spectrum Golf,** R and R went into an area in the market where few others had gone — outdoor games simulation. The cassette was an immediate success and it is still regarded as one of the best versions of golf running on a microcomputer.

The golf course on which the player struggles to keep to par is shown from a high vantage point and includes all the dangers, such as trees, lakes, and the rough, as well as the green and the hole. It is possible to choose from a limited number of clubs and directions are determined by using a clock face, rather like when flying an aircraft.

The company produced a version of **Star Trek** which started the move away from copying the original mainframe computer version and introduced some interesting graphics. Star Trek was followed by another old favourite for the Spectrum, Pacman, which R and R, known for its originality, named **Gnasher.** The Club is offering 30 percent off all these games.

Saturn Developments is supplying its excellent and inventive space adventures at a discount of 30 percent to club members. With this exclusive offer you can send for **Mines of Saturn** and **Return to Earth,** which is the sequel to the first game. The normal price of both games, which are available for the Spectrum and ZX-81, is £5.50, so the discount offered is substantial.

This month's reductions are shown below. As usual, we make two special offers and this month we have been able to obtain a special 30 percent reduction on retail prices exclusively for club members.

R and R can be contacted at 34 Bourton Road, Tuffley, Gloucester.

Saturn Developments can be reached at Dept PK, 37 Heol Durlais, Birchgrove, Swansea SA7 9LT.

New members of the club will be able to take advantage of the offers before they have been registered as club members. All you have to do is send your order with the membership form. In that way you can take advantage of any offer and join the club.

This month we are offering both the R and R and Saturn Developments full ranges of products. Both companies are major software houses and an offer like this is a priority.

R and R Software	Usual price	Offer price
Golf '81	£3.75	£2.62
Golf (Spectrum)	£3.75	£2.62
Gnasher (16K Spectrum)	£4.95	£3.45
Star Trek (48K Spectrum)	£4.95	£3.45

Saturn Developments	Usual price	Offer price
Mines of Saturn	£5.50	£4.85
Return to Earth	£5.50	£4.85

Cassettes on the high seas

SINCLAIR USER CLUB cassettes are finding their way in and around some of the most unlikely places.

Member Alan Thomas is a merchant seaman and takes his computer on all his voyages. On his last voyage which lasted five weeks he took his club cassette with him.

One of the games on the cassette is Oxo, a simple enough game, you may think. Not so, says member Thomas; the ZX-81 almost melted from continuous use by almost every member of the crew being addicted to the game, including the captain.

When we asked him if anybody beat the computer he replied: "I beat it twice while the captain managed to beat it only once."

We are now wondering if Thomas will want to take our latest club cassette with him on his next voyage. One of the games on the cassette is Missile.

Incidentally, Thomas contacted us originally with a technical problem on the

continued on page 10

MEMBERSHIP FORM

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Sinclair User Club

continued from page 9

telephone help line, which is just one of the club facilities.

The number for the help line is included in the cassette newletter, which is sent to members every two months. The cassette also has news and tips to help members make the most of their machines.

Other features of our growing User Club are regular special offers by which members can obtain large discounts on a wide range of software and hardware items. The latest offer can be seen on the previous page.

Another feature is a cassette recorder head-alignment service. For a small fee we offer to improve cassette players so that loading and saving is improved.

All those benefits can be obtained by filling-in the coupon on the previous page, being careful to inform us which machine you own so that the correct cassette can be sent.

Britain

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street, Aylesbury (5181 or 630867). Meetings: first Wednesday and third Thursday of the month.

Colchester Sinclair User Group: Richard Lown, 102 Prettygate Road, Colchester CO3 4EE.

Doncaster and District Micro Club: John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357. Meetings held on second and fourth Wednesday of each month.

Eastwood Town Microcomputer Club: E N Ryan, 15 Queens Square, Eastwood, Nottingham NG16 3BJ.

Edinburgh ZX Users' Club: J Palmer (031 661 3183) or Ken Mitchell (031 334 8483). Meetings: second Wednesday of the month at Claremont Hotel.

EZUG-Educational ZX-80ŝ1 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other week on Wednesday evenings.

Glasgow ZX80ŝ1 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241). Meetings: second and fourth Monday of each month.

Gravesend Computer Club: c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Bi-monthly magazine and membership card.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).

Lambeth Computer Club: Robert Barker, 54 Brixton Road, London SW9 6BS. Interest in educational software. Once running, will be affiliated to the Association of London Computer Clubs.

Liverpool ZX Users' Club: Keith Archer, ZX Computer Centre, 17 Sweeting Street, Liverpool 2. Meetings every Wednesday, 6.30 to 9.30 pm.

Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

Micro Users' Group: 316 Kingston Road, Ewell, Epsom, Surrey KT19 0SY.

National ZX-80 and ZX-81 Users' Club: 44-46 Earls Court Road, London W8 6EJ.

Newcastle (Staffs) Computer Club: Meetings at Newcastle Youth and Adult Centre, Thursday, 7.30 to 10.00pm. Further information from R G Martin (0782 626065).

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

Northern Island Sinclair Users' Club: R Gibson, 11 Fitzjames Park, Newtownards, Co Down BT23 4BH.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.

Nottingham Microcomputer Club: ZX-80ŝ1 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Orpington Computer Club. Roger Pyatt, 23 Arundel Drive, Orpington, Kent (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Regis Amateur Microcomputer Society: R H Wallis, 22 Mallard Crescent, Pagham, Bognor Regis, West Sussex PO21 4UU.

Scunthorpe ZX Club: C P Hazelton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield ZX Users' Club: A W Moore, 1 Ketton Avenue, Sheffield S8 8PA, Yorkshire. Annual subscription 10, monthly newsletter and cassette.

Sittingborne: Anurag Vidyarth (0795 73149). Would be interested to hear from anyone who wants to start a club near the Medway towns.

Stratford-on-Avon ZX Users' Group: Chris Parry, 16 Sackville Close, Stratford-on-Avon, Warwickshire.

Swansea Computer Club: B J Candy, Jr Gorlau, Killay, Swansea (203811).

Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and library.

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.

ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH. Please include sae. Meetings twice monthly.

ZX Guaranteed: G A Bobker, 29 Chadderton Drive, Unsworthy, Bury, Lancashire. Exchanges information and programs throughout the country.

ZX-80/ZX-81 Users' Club: PO Box 159, Kingston-on-Thames. A postal club.

Overseas

Belgian National Sinclair Users' Club: P Glensson, Rue Abbe De l'Epieestraat, 14, 1200, Brussels.

Belgium, France, Luxembourg: Club Sinclair, Raymong Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (322 6537468).

Belgium, Netherlands: Microcomputer Vereniging BZW, Paul Glenisson, Priester de l'Epieestraat 14, B-1200 Brussels, Belgium (322 7349954).

Denmark: Danmarks National ZX-80ŝ1 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.

ZZ-Brugergruppen i Danmark, Boks 44, 2650 Hvidovre, Gratis medlemskab og gratis blad til enhver interesseret.

East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).

Germany: ZX-80 Club, a postal club; contact Thomas Jenczyk. Hameln, Postfach 65 D-3250 Hameln, Germany.

Indonesia: Jakarta ZX-80ŝ1 Users' Club, J S Wijaya, Jakarta, Indonesia.

Irish Amateur Computer Club: Martin Stapleton, 48 Seacourt, Clontarf, Dublin 3. (331304).

Republic of Ireland: Irish ZX-80ŝ1 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

South Africa: Johannesburg ZX80ŝ1 Computer Users' Club: S Lucas, co Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg.

Johannesburg ZX Users' Club: L*f*enn*f*ert ER Fisher, PO Box 61446, Marshallstown, Johannesburg.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana. International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine. Spanish ZX Micro Club: Apartado 181, Alicante (Costa Blanca), Spain.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611. — Harvard Group, Bolton Road, Harvard MA 01451; (617 456 3967).

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NOTE

The case can be purchased separately with the keyboard aperture uncut, so if you have one of our early uncased keyboards, or in fact any other suppliers' keyboards, these could be fitted. The keyboard is connected to your computer by a ribbon cable and this has connectors fitted which simply push into the Sinclair connectors. It is a simple two minute job and requires no electronic skills. This keyboard does not need any soldering. Please specify on order whether you require the ZX 81 or Spectrum case.

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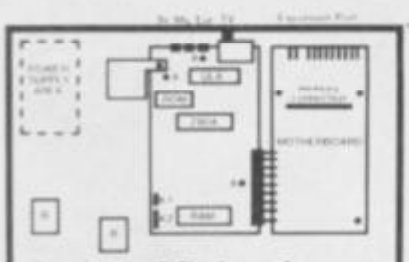
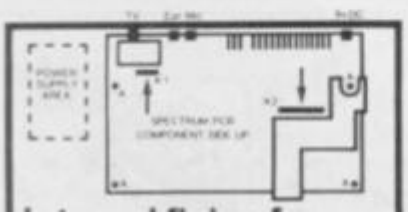


Internal fixing for ZX 81 keyboard case.



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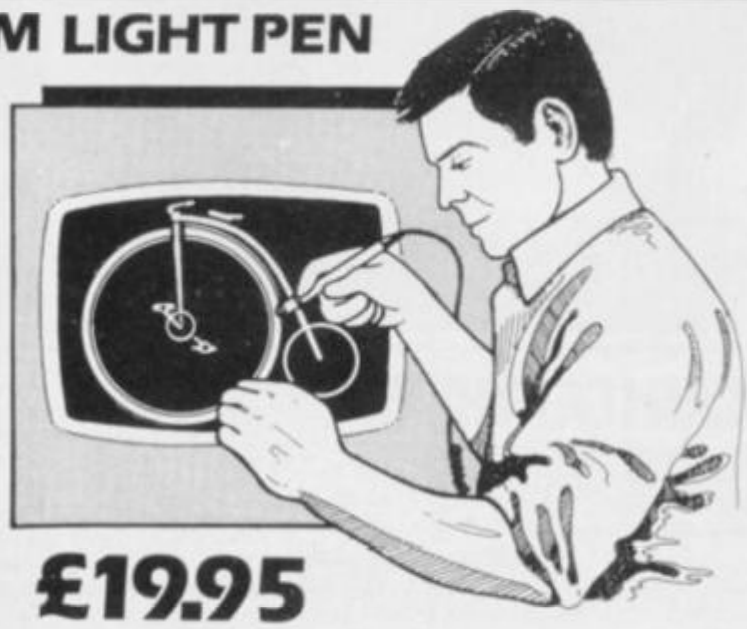

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ZX 80~81 Spectrum HARDWARE

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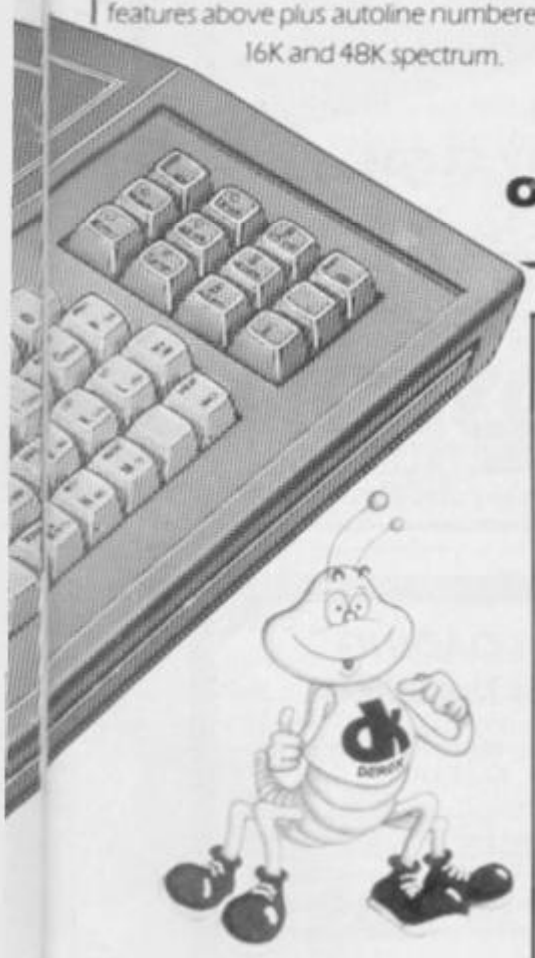

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Million Sinclairs sold throughout the world

SINCLAIR RESEARCH has claimed that it is the first company to sell one million home computers throughout the world. The company is now producing one computer approximately every four seconds on the production line in Dundee.

They are added to the 130,000 ZX-80s, 750,000 ZX-81s and 200,000 Spectrums already sold to users around the world.

In addition to one million Sinclair computers the company estimates that 600,000 computers have been manufactured under licence by Timex for sale in North America.

Clive Sinclair, chief executive and chairman of Sinclair Research, is very pleased with the figures. He says:

"The figures are a magnificent achievement for all concerned. With the ZX-81 entering its third year of production, the figures demonstrate beyond doubt the long-term viability of the computer as a consumer product."

The Sinclair claims are disputed by Commodore, which manufactures the Vic-20 and Vic-64 machines.

CLIVE SINCLAIR
'Magnificent achievement'

Commodore made a similar claim to that of Sinclair Research several months ago and states that it passed the one million mark last year.

Flying start for ZX-81s

INTEREST IN computers in the armed services is not concerned only with the technology of warfare. The Royal Air Force is to launch a computer association on May 7 at RAF Newton, near Nottingham.

There is wide interest in Sinclair machines and publicity officer Flight-lieutenant Otridge, says he has a ZX-81. He says: "The association is not machine-based, although most members have their own machines which they take to their local clubs. What we aim to do is to provide a world-wide link for local station clubs.

"Members from as far away as Germany and Port Stanley have become interested. We want to help existing clubs — and there are many of them — and also to interest other stations sufficiently to start a club."

Anger at growing software libraries

SOFTWARE manufacturers are becoming increasingly angry about the growth of lending libraries.

Tony Baden of Bug Byte, one of the biggest software houses in Britain, said: "We do not like these libraries at all. They are taking the royalties from authors and generally doing the industry no good."

Most companies regard software copying as stealing. Mike Meek of MikroGen said: "It is like walking into W H Smith and taking a £6 cassette without paying for it."

The lending libraries, however, insist that they are doing their best to keep on the side of the law. Steven Stones of the Software Lending Library said: "I will agree to any reasonable proposals from the software houses, as I feel that I am working on their behalf more than anyone else."

Alec Fry of the Sinclair Owners' Software Library said: "We deal only with tapes bought with the manufacturers' approval and operate only with their permission. Manufacturers benefit from our service because when a tape wears out we order more."

Power packs fault found

A BATCH of power packs for the Spectrum has been found to be dangerous and the company has mounted a major campaign to contact all the people affected.

The packs are being used with Spectrums sold since the beginning of the year and have a black and white lead.

The company says the numbers involved are relatively small, as only one supplier is involved. It also emphasises that only the power pack is involved and that the computer is safe.

Anyone with such a pack should cease to use it immediately and return it to Sinclair Research at a special depot which has been set up to deal with the problem at Unit F, Broad Lane, Cottenham, Cambridgeshire CB4 4SW.

Show date

IN OUR LAST issue we dealt with shows and exhibitions throughout the country and stated that the Northern Computer Fair was to be held on March 12. That was an error and the date should have been March 26 at the Pudsey Civic Centre, Dawson's Corner, Stanningly.

RAMCS change refused

REQUESTS by hardware manufacturers for the incorporation of a device, called a RAMCS, to allow extra ROMs to be used on the 48K Spectrum have been refused by Sinclair Research.

At the moment it is possible to put extra ROMs on to the 16K machine but, because of the way the extra 32K memory and decoders are arranged, it is impossible for such insertions to be made on the 48K Spectrum.

"The change is so simple," explained Stephen Adams, the man who put the modifications to Sinclair Research. "All that is required is a resistor and a piece of wire. The change could be incorporated into the production line or made when machines are returned for repair."

Adams also suggested that a company nominated by Sinclair Research could do the modification without invalidating the guarantee of a machine.

Manufacturers of EPROMs and other hardware add-ons are also interested in the modification, because it would allow them to sell chips to the public and also sell software in ROM. The RAMCS will also allow a second processor, such as the 6502, to be used. That is possible on the BBC microcomputer and would be an advantage on the Spectrum.

Kailafh Pandy of Cambridge Microelectronics is one of the manufacturers who would like to see the RAMCS installed. He said: "We would welcome it tremendously. We do not produce anything for the Spectrum yet because it is not possible to incorporate anything on to the board. We have heard a rumour that Timex is incorporating it on to the TS-2000 in the States and we would like it on the British version."

More news — page 16

Oric off to good start

THIS MONTH Oric International Products is due to launch a series of peripherals for its new computer, the Oric One. They include a four-colour printer, modem and the capacity for the use of microdiscs on the system.

There are no definite dates for the launch of the products but Oric claimed at its launch in January that prototypes of the devices were ready and it was only a question of starting production. The Oric was sold by mail order until March, when Oric was launched in stores such as W H Smith and Currys. Peter Harding, Oric sales director, said:

"We knew we had a good product on our hands, but its success has far exceeded our original expectations. The more than 3,000 orders received from mail order customers were dealt with by the end of February."

Microdrive delay

CLIVE SINCLAIR declined to address a meeting of the Institute of Electrical Engineers in February because a model of the Microdrive was not ready to be demonstrated at the meeting.

A representative of the company also declined the offer to attend the meeting held at the Institute's headquarters. The reason given by the chairman, Denis Flexney-Briscow, was that "the Microdrive has been delayed yet again. We promise to bring it to you later in the year, so continue to watch this space."

One of the last-moment speakers was Dr Ian Logan, author of several books on Sinclair ROMs, who has been working on the software for the Microdrive. He gave away no secrets but said:

"I may have written the software for the device but to be honest I don't know what is on the other end of the wire."

Other speakers were Andrew Hewson and Stephen Adams, who both contribute to *Sinclair User*. Hewson discussed the history of Sinclair machines and the structure of the Spectrum memory map. He also showed how a Basic program is stored in the machine.

Adams, no stranger to the hardware world, talked the audience through the various chips on the Spectrum printed circuit board and then showed the type of add-ons which can be used.

Spectrum helping in the treatment of dyslexia

THE SPECTRUM is to be used in a project to help diagnose and treat dyslexia, a disability which causes disorientation of the senses, particularly of sight, in the sufferer.

The project was started by Brother Henry, director of the Mayfield College for Boys, in 1980. At that time computers, such as the Pet and RML 380-Z, were used to produce the software, which was a result of some spare-time programming by boys at the college.

He says: "The response has been so great that it has become too great for me. I have had to delegate the responsibility to regional information centres.

"I am waiting for the Microdrive to arrive to do any further work. We think that the Spectrum is the ideal machine to use in this type of work because it is possible for most people to buy one.

For more information on the project, telephone 0435 872031 during office hours.

Fires delay some deliveries

CUSTOMERS who have ordered items from the Jigsaw range of products manufactured by Phoenix Marketing have been experiencing delays in deliver. The two main reasons are that Phoenix had a fire at its premises and distribution was switched to another company, CAPS.

The agreement with CAPS has now ended because of problems with supplies from Phoenix. CAPS now says that since early February it has not been willing to accept any responsibility on behalf of Phoenix, which includes its previous arrangement of supplying refunds to people who had not received goods which had been ordered.

The software house Ground Control is experiencing delays in despatching orders. A spokesman for the company says that the stocks of products were available but because of staffing problems there is a backlog.

Harrison and Lockyer, a company which deals in hardware distribution, had a fire at its premises. As a result there are delivery problems.

The situation concerning the mail order firm Pretorius Systems is still being investigated. Customers of the company with a complaint who have not contacted *Sinclair User* are advised to write to the advertisement manager. Those customers who have contacted the magazine are advised that they will be updated on the situation in the near future.

Silversoft has had to move to a temporary address due to lack of space. It is now at 2 Hammersmith Broadway, London W6. The company does not see any difficulties concerning orders and all customers should receive their goods in the usual time.

Sinclair Research structure

TO CONTINUE with the company growth, Sinclair Research has a new corporate structure. The re-organisation makes room for an enlarged board of directors and two divisions have been created to handle current and advanced products.

Clive Sinclair retains control as chairman and chief executive. He will supervise the advanced projects division, which at present is developing the flat-screen television.

Nigel Searle becomes managing director of the current products division. He will be responsible for marketing the personal computers already on the market, along with any peripherals launched and, of course, software. New products launched by Sinclair Research will be transferred to this division.

The board is to include four new members — Bill Matthew, finance director; Dave Hatten, production manager; Jim Westwood and David Southward, who have become research and development directors. Kenneth Dick, chairman of New Court Trust, has been appointed as a non-executive director.

SPECTRUM AND ZX81 HARDWARE

PANDA

The famous Panda Expandable Ram Pack. Massive 16K add-on memory which can easily be expanded to 32K with an optional plug-in module. Supplied in rugged no-wobble design, rugged, injection moulded case, contoured to fit the ZX81 snuggly. Compatible with other add-ons (printer etc). LED on/off indicator. No additional power needed just plug in an go. British designed and made from top quality components throughout, guaranteed 12 months.

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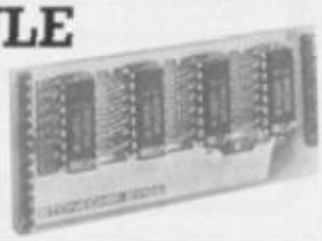
EXPANSION MODULE



The 16K 'Panda' is easily expanded from 16K to 32K by adding this expansion module as and when you need it.

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GIANT PANDA

Giant Panda the two together. Buy the Panda and the Expansion Module at the same time for a gigantic 32K bytes and save.
Complete at a special price of **ONLY £40·00**

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FOR ZX81 OR SPECTRUM

This famous, best selling product immediately converts your ZX Computer into a sturdy, attractive and professional unit, with full size typewriter keyboard. A tough plastic case encloses the keyboard, PCB and power supply. It has 42 keys including all the ZX81/Spectrum graphic characters printed on them. The full travel key switches have gold plated contacts and guaranteed life of 10^7 operations. It's so easy to install! You simply unscrew the ZX PCB from its case, screw it to the FD case, and plug in the keyboard. No soldering or technical knowledge required.

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Our new advanced keyboard has the same, fine specifications as the FD42 system, but with a new re-designed case, space bar and double-sized shift and enter keys. A must for the discerning ZX81 or Spectrum user.

ONLY £39·95

ZX KLIK – KEYBOARD

If, like many ZX81 users, you are fed up with the dead feel of the touch sensitive keypad then consider the well tried 'Klik-Keyboard'. This is a simply fitted genuine push button keyboard which has been designed as an exact replacement for, and is no larger than, the existing keypad. ■ Fits on to the ZX81. ■ Full 40 keys plus one spare for any purpose. ■ No soldering – just plug in. ■ No trailing wires. ■ Clear permanent two colour legends. ■ Positive feel and sound as data is entered. ■ Speeds up programming enormously and reduces errors. ■ Fitting service offered £2·00 extra (remember to send your ZX81).

ONLY £24·50

THE SOUND EXPANDER

A superb economical addition to your ZX Spectrum. Clear, dynamic sound effects will really enhance your enjoyment of the new exciting programs available for the Spectrum. Our new sound amplifier comes complete with leads, volume control and built-in loudspeaker. Simply plug into the mic input, it fits neatly on to the back of the Spectrum.

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I wish to order the following:

Quantity	Item	Amount
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	Expansion Module @ £20·00 inc.	
	Giant Panda @ £40·00 inc.	
	FD 42 Keyboard ZX/Spectrum* @ £29·00 inc.	
	FDS Keyboard ZX/Spectrum* @ £39·95 inc.	
	ZX Klik-Keyboard @ £26·50 inc.	
	Sound Expander @ £7·50 inc.	
	Spectrum Upgrade Pack @ £35·00 inc.	
	TOTAL	

All prices include VAT and post and packaging. All items include a full year guarantee. Cheques/Postal Orders etc. should be made payable to: AFDEC Electronics Ltd.

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Address _____

Overseas customers add £4 post and packing

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ELECTRONICS LTD

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ZX81 GAMES
from

J.K. GREYE SOFTWARE LTD

PLEASE NOTE

As from March 31st the ZX81 games currently available from this company will be marketed solely by two separate companies as follows

---

Gamestape 1 — 10 games for 1k

Gamestape 2 — Starfighter, Artist Pyramid

Gamestape 3 — Catacombs

From:

J.K. GREYE ENTERPRISES
16 Park Street
Bath

Gamestape 4 — 3D Monster Maze

Gamestape 5 — 3D Defender

Gamestape 6 — Full Screen Breakout for 1k

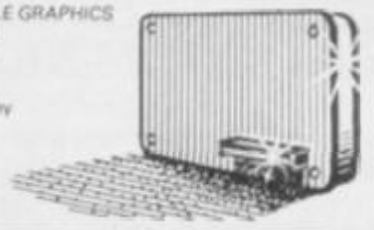
From:

NEW GENERATION SOFTWARE
16 Brendon Close
Oldland Common
Bristol

Any enquiries concerning the above games should be made to the respective companies.

ZX81 HI-RES Graphics Pack!

* Fully programmable 256 by 192 pixel High Resolution display
* Powerful Hi-Res-BASIC Monitor in 2K EPROM includes PAGE, PRINT, PLOT (inc. LINE), SCROLL, INV, CLS, COPY
* Includes LOWER CASE CHARACTER SET for word processing
* *Full dynamic control of USER DEFINABLE GRAPHICS*
* Slim, stylish case fits between ZX81 and RAM pack
* No additional power supply or soldering necessary
* Complete with handbook containing many examples



PRICE £38.95 inc.
Please send SAE for data sheet
Please allow 28 days delivery.

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Enemy aircraft approaching . . . BATTLESTATIONS!! Waves of enemy fighters swooping in for the attack? Can you survive another mission? This is the ULTIMATE challenge. An entertaining machine code game with excellent graphics. Requires 16K RAM pack only.

Highly addictive! **£4.95 inc.**

Now Available at major branches of WHSMITH

FIGHTER PILOT

15 feet . . . 7 feet . . . TOUCHDOWN! Instrument landings are not always as easy as this. You are in full control from take-off to landing during this real-time flight simulation of a jet fighter. Written by pilots — tested by pilots — for you to fly like a pilot.

'An excellent program!' Capt. H. Senior British Airways pilot.
Requires 16K RAM only **Super value at £4.45**

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TRADE ENQUIRIES WELCOME

All prices inclusive
(Overseas add £0.55 p&p per tape, £2.00 for HRG board)
All products guaranteed, refund if not satisfied.

Printer packages need adapting for Spectrum

AFTER A WAIT I received a ZX printer to add to my Spectrum. The manual with it told me that I must use the specially beefed-up power pack supplied. When I came to connect I found that it would not fit; the lead ends in a jack plug, whereas the Spectrum requires a hollow plug to fit over the pin in the socket. Also, since the manual gives programs only for the ZX-81 and there is no mention of the Spectrum, I concluded that I had been sent a package suited only for the ZX-81.

So I packed everything ready to return and telephoned Camberley. One of the best features of the Sinclair selling organisation is the pleasant and knowledgeable young woman on the end of the line there. She told me that I should use my existing Spectrum power pack — there is no mention of that anywhere else in the literature — and admitted that the manual was unsuitable. So although I have my printer, I have a dud manual and an unwanted second power pack, both suitable for the ZX-81, not the Spectrum, and for both of which I have paid.

The Sinclair organisation gives me the impression of being very fair to its customers in compensating for its failings. I suggest that the following action is now required:

A buy-back of the redundant ZX-81 power packs supplied to Spectrum owners who ordered ZX printers.

The supply of appropriate manuals to those people.

That future orders for ZX printers should specify whether they are for the Spectrum or the ZX-81. Spectrum orders would be fulfilled by the ZX printer and suitable manual only — no power pack — with an appropriate reduction in cost.

P G New,
Harpenden, Herts.

• *Sinclair Research says that it is considering the points made, adding that the printer is supplied as a complete product and it is not possible to split the package depending on the intended use. Removal of the power supply would have only minimal effect on price and at present would lead to confusion in the fulfilment of orders.*

Monster mistakes

I WOULD like to make three comments about the J K Greye Software 3D **Monster Maze** program.

The program instruction says that the maze exit is at the end of a cul-de-sac and that the generated maze is always formed in corridors.

I found the exit in a corridor once. As it was not at the proper place, it has twice raised from nowhere on my screen. I found a great open space in the maze. Information provided by the program was incorrect because in the reality Rex would be able to see me but the program said "Footsteps approaching" until the last two moves of T Rex — i.e., too late for me.

I regret that a £5 or £6 program in Britain is sold for nearly £14 in France. Is the Channel such a large sea to justify such a surcharge, even with tax surcharges? That fact must induce illegal copying and selling.

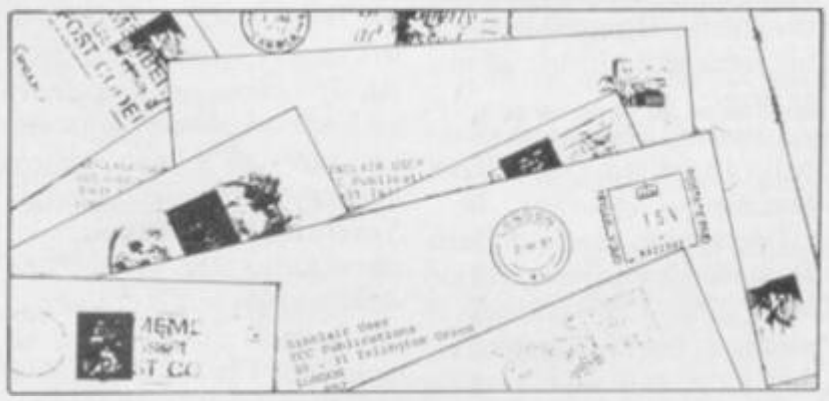
I would like to ask firms in the U.K. to include overseas packaging surcharges in their advertisements.

Finally, I am looking for a pen friend with whom I shall be able to swap ideas and programs. I am ready to make contact with anybody, wherever he may be in the world. He has just to own a ZX-81.

When will the Spectrum with a built-in SECAM colour system modulator be sold? From time to time the French computing press speaks about Sinclair pocket TV. Will it be ready soon in Britain? Will it soon be sold in France?

I have read your magazine since June, 1982 and it is super great.

Perceval de Montarby,
40 Ave des Tilleuls,
75016 Paris,
France.



Education sales higher

AS THE MAJOR distributor of Sinclair personal computer products to education and the sole distributor of equipment on the Department of Industry scheme, my company has been distributing SRL products for more than two years. The article, headed Spectrum school sales slow, may well cause some people to misunderstand the well-established sales procedure for education. I should like to take the opportunity to explain some details.

Griffin & George was appointed as educational distributor soon after the launch of the ZX-80. As we had been dealing with the supply of science equipment for education for many years, we could supply SRL products using our established

continued on page 20

Tips for postal selling

WITH REFERENCE to your reader's letter in the February issue, I would like to make the following points about my company:

All orders are despatched within 24 hours or less from the time of receipt.

We can do that only because of our policy of not advertising or taking orders for products which are not available from stock.

That sometimes means upsetting advertisement managers of various magazines who like to book space at least three months in advance.

A product must be shown to be fully working before taking orders, i.e., not a prototype or mock-up.

Enquiries take time; as the customer has not paid for time spent orders come first. Second, customers not sending SAEs will go to the bottom of the pile.

The best thing is to telephone and ask whether the product is ready if you send your money today. Send a SAE with any enquiry and with a legible address and, if possible, a telephone number, as it is often cheaper to telephone than post a letter.

Stephen Adams,
London, N16.

continued from page 19

invoicing-after-delivery procedure. That has remained the case for the ZX-81 and the Spectrum.

As educational distributor, Griffin & George provides a range of hardware accessories and software specifically to support the product in education. We also have a large technical and sales staff to run exhibitions and training workshops. It is obviously cheaper for teachers to benefit from that rather than having to provide the resource within individual local education activities.

Unlike either of the other machines in the DoI scheme, our customers or the local education authority do not need stocks of expensive spare parts and to have skilled, expensive technicians to fit them. Griffin & George administrates any repair procedure, normally manifested as a rapid one-for-one exchange.

As to the rate of sales to schools, they are exceptionally high and not, as your headline may suggest, slow.

R M Lovett,
Microelectronics manager,
Griffin & George,
Birmingham.

Scrolling made easier

A FEATURE lacking on the Spectrum is the SCROLL command. Although substitutions have been published for it, involving POKEing and PRINTing, I believe my solution is much neater. Simply by calling the USR routine, USR 3280, a scroll of one line is performed with no fuss.

I hope this will be of some use to your readers and I congratulate a magazine which improves with age rather than being thinner with time.

Peter Bernstein,
Northwood,
Middlesex.

Code junkies are usually male

J E M FRADGLEY — letters, February 1983 — should not worry about her daughter. My articles on Code Junkies — December 1982 — took a male stance simply because our female students appear to be immune from the addiction. Why is not clear and a straw poll in our department produced suggestions that girls complete adolescence earlier, are under less parental pressure, lead a more active social life at university, or simply show a higher innate level of common sense.

Our own experience shows that our female students are far more likely to get good degrees in computer science.

C F Reynolds,
Reader in computer science,
Brunel University,
Uxbridge.

Beginner's queries

I PURCHASED a 48K Spectrum and programmed the Sinclair **Hangman.** It did not work and Sinclair admits an error.

I ordered 10 cassettes and only two arrived. One will not load.

I decided to program **Dam Buster.** Can anyone tell me what line 135, graphic E means, or line 2000 graphic D. Am I the only idiot playing with a Spectrum?

G Abrahams,
Birchington, Kent.

• *You appear to have been more unfortunate than most with your new machine. To help your understanding of our listing system; because the reproductions of the graphics characters can be confusing, we have tried to make it easier to enter them by denoting which key should be pressed.*

Instead of printing a black blob we indicate that it is an inverse space. Your query involves the user-defined graphics which are entered by going into graphics mode and pressing, in line 135, the E key. When the program is run it will appear as the character which has been defined in another part of the program.

Television problem

I BOUGHT a Spectrum and am experiencing some difficulty tuning it in to my TV set. Often to get a respectable picture it has to be tuned so that the display is in black and white. If tuned to be in colour, the lettering is very wavy and not at all clear. I have tried it on other sets and it would appear to be satisfactory.

I am told that it may be incompatible with the TV set. Can that be so and what can be done about it?

The set is a Hitachi CAP-162 colour portable.

G P Glover,
Bradford.

• *A small number of television sets appear incompatible with the Spectrum, resulting from problems which occur with the exchange of signals which produce the television display. Sinclair Research is investigating the problem in detail and has said it can advise customers or potential customers. The Spectrum could be re-tuned but that would make it incompatible with other television sets.*

Finding a better beep

AS A SINCLAIR addict I have bought every copy of your magazine since issue one in April, 1982 and would like to congratulate you on an excellent publication.

My ZX-81 has since passed on and I now have a 16K Spectrum — not without the usual difficulties, I might add. I would like to raise two points which may be of interest to 16K Spectrum users:

The first entry I always make at the start of a programming session is POKE 23609,100. The difference it makes to the keyboard beep is amazing and I cannot imagine why it was not built into the ROM.

I was tempted to enter **Pontoon** published in your January, 1983 edition, despite the fact that it was written for 48K. I was able to do this by omitting the playing instructions in lines 220-290 inclusive and the excellent program now runs faultlessly on my 16K.

Colin Kostyrka,
Maidstone, Kent.

Program improved

WITH REFERENCE to John Gilbert's continuous series on good programming, may I make a suggestion? If a safeguard against an invalid numeric input is incorporated in line 1050, or after, together with any desired message to the user, it is then possible to replace lines 300 to 700 with the single statement:

GOSUB 1000 ÷ (VAL A$*1000)

That is surely nearer to good programming than a series of time- and memory-consuming, unnecessary IF ... THEN statements. What would he have done with, say, 30 subroutines? The mind boggles.

M Gordon,
Southgate, N14.

Corrected prices

THANK YOU for your excellent review of our arcade game **Scramble.** We would like to point out that the correct price is £5.50 plus 40p p&p. Also we would like to point out that the correct price for **Sorcerer's Castle** is £5.50 and not £6.50 as printed in the club offer.

M Meek, Mikrogen,
Bracknell, Berkshire.

GET THE BEST NEW PROGRAMS AND THE ALL-TIME GREATS, SPECTRUM OR ZX81

AT SOFTWARE SUPERMARKET NOW

We started Software Supermarket with just one idea. To play all the Spectrum and ZX81 games we could find, to select the very best, and to offer only those to our customers.

Judging by our mail from all over the world, you're very pleased with our free selection service. It's impartial (we produce no programs ourselves) and it saves you £££'s on stamps and mistakes.

And it's fast. We usually despatch your order within 48 hours. Here's the best of the new and the best of them all for your Spectrum. Plus some great ZX81 games. Full detailed catalogue sent free with every order. Or send large SAE for catalogue only.

ZX SPECTRUM: 16/48K

Our latest Top 10 Programs for your Spectrum. They run on both 16 & 48K.

3D TUNNEL Brilliant NEW 3D graphic game by Malcolm "Escape" Evans. Fly down the winding 3D tunnel shooting bats, spiders, frogs and rats! Demo mode: 3 speeds: training program for each phase. And (48K only) watch out for the Tube train! (New Generation) £5.95

3D TANX NEW game with stunning graphics. Shoot the enemy from your 3D tank turret. 3 play levels: accurate ballistics: 1 or 2 players: hold feature: demo mode: training program. And choose your own control keys: even plays 'God Save The Queen'! (DK'Tronics) £4.95

WINGED AVENGER *"One of the best...covers all the stages of the arcade original...a game to come back to." Pop Comp Wkly.* Very fast 'PHOENIX': 7 play levels: 3 attack waves: laser shield: mothership with smart bombs. (Work force) £4.50 (16K ZX81 version, £4.50)

GROUND ATTACK *"Best Spectrum version of the arcade game" Yr Comp "Very absorbing" E&C. "Extremely good" Pop Comp Wkly.* Thrilling SCRAMBLE: Pilot your ship thro' 26 zones: up, down, brake, thrust: smart bombs: as you get better, it gets harder. (Silversoft) £5.95

CENTIPEDE The first - and fast - Spectrum version of the famous arcade game. Full arcade movement - left, right, up, down, fire - as you attack the centipede. Great graphics. Watch out for the jumping spider! 3 lives: hold feature. (DK'Tronics) £4.95

ESCAPE *"One of the best and most original games we have seen" S.User.* 5 very real dinosaurs chase you round the maze as you search for the axe to escape. Different maze every time. 5 play levels: 9 speeds: Hall of Fame. (New Generation) £4.95

GULPMAN *"The one cassette that I would buy...an exceptional program." Pop Comp Wkly* 15 mazes, each with demo mode: 9 speeds: laser gun helps against 4 chasers: Program your own control keys: personalise/save your very own game. (Campbell) £5.95

COSMOS NEW! Fantastic graphics. Loads in 2 parts (instruction manual first). Protect your 9 ships against 18 aliens, warp mines, asteroids. Your graphic on-board computer helps with elaborate displays. Our favourite new game. (Abbex) £5.95

FAUST'S FOLLY The first adventure we've seen that's worth playing in 16K. It's great and it's got graphics! Loads in two parts: clear instructions first. Then a smashing adventure with directions, inventory, look, score, save. Amazing! Abbex) £5.95

OTHELLO *"Recommended without reserve...a superb opponent" Yr Comp.* The great 19th Century power game. Surround your opponent: capture his territory. Millions of different games: maximum 60 moves each. 1 or 2 players: demo game: 9 skill levels: print. (Mol) £7.95

ZX81 OWNERS!

Special 16K ZX81 versions of 6 of these programs are available:

WINGED AVENGER	**£4.50**	**PIMANIA**	**£8.00**
OTHELLO	**£6.95**	**CHESS 2**	**£9.95**
BLACK CRYSTAL	**£7.50**	**GREAT BRITAIN LTD**	**£4.95**

Use the coupon to order. Free detailed catalogue of our best ZX81 games with every order. Or send large SAE for catalogue only.

48K SPECTRUM ONLY

These programs use nearly all the Spectrum's 48K. They will not run on the 16K Spectrum. But there are versions of Black Crystal, GB Ltd, Pimania and SpecChess for for 16K ZX81.

PIMANIA *"The best adventure game we have reviewed" S.User. "An adventure enthusiast's dream" C&V Games.* Best use of Spectrum graphics and music we've seen. A wonderfully witty adventure - and you could win the £6,000 Golden Sundial of Pi (Automata) £10. (ZX81 16K version: £8)

TIMEGATE *"The best graphical game I have seen on any micro" Interface. "Excellent graphics...one of the best" Yr Comp. "Fast and furious...required playing for any Spectrum owner" Which Micro?* 5 skill levels: training program: Hold: Hall of Fame: keyboard overlay: 26-page on-screen manual: (Quicksilva) £6.95

THE HOBBIT *"Superior to any other adventure game available for the Spectrum" Yr Comp.* Free 285-page illustrated book of The Hobbit contains clues to help solve the adventure. 30 beautiful full-screen pictures: 500 word vocabulary: 16 page instruction manual: save: print: pause. It took 4 people 18 months to write! (Melbourne House) £14.95

GREAT BRITAIN LTD *"A colourful and sophisticated management game" Pers Comp Wld: "Difficult and challenging" ZX Comp.* Even plays 'Rule Britannia'! Choose your party and run the country. Will inflation and unemployment come down or the rioters come out? It's up to you. Then watch the results on election night! (Hessell) £5.95 (16K ZX81 version, £4.95)

SPECCHESS *"The standard for ZXChess" ZX Comp: "The strongest chess program" Pop Comp Wkly.* Full graphic chessmen: 7 play levels: all legal moves: position analysis for problem-solving: recommended move option: print game history. (Artic) £9.45 (ZX81 non-graphic 16K version £9.95)

BLACK CRYSTAL Take the adventure of your life. 180K of program to unravel, on two thrilling cassettes! You must solve each of the 6 stages to defeat the Lords of Chaos. Real-time monster battles: 16 command keys. (Carnell) £7.50 (16K ZX81 version: Over 100K loads in 7 parts. £7.50)

Post to: SOFTWARE SUPERMARKET, 87 Howard's Lane, London, SW15 6NU.

If you do not want to cut this magazine, write your order out carefully on plain paper and quote this number: **SU5** Mail Order Only.

I own a 16K Spectrum ☐ 48K Spectrum ☐ 16K ZX81 ☐ (please tick)

I enclose my Cheque/PO for £..... payable to Software Supermarket.
Please use block capitals. If we can't read it, you won't get it.

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Program Name	Computer	Price

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	EUROPE. Add 55p for each program	£
	OUTSIDE EUROPE. Add £1 for each program airmail	£
	TOTAL	£

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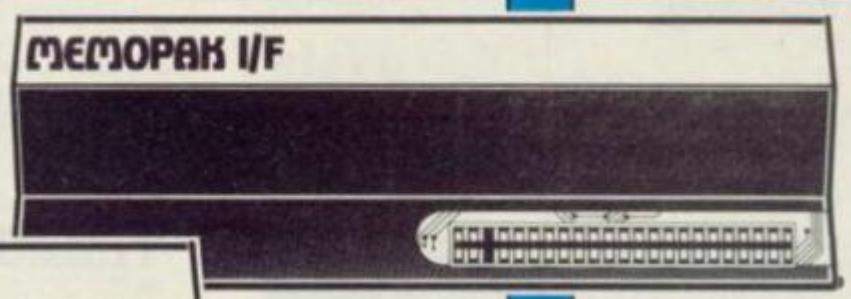
At Mem we realise the poten

MEMOPAK 16K For those just setting out on the road to real computing, this pack transforms the ZX81 from a toy to a powerful computer. Data storage, extended programming and complex displays become feasible.
For even greater capacity, memory packs can be added together (16+16K or 16+32K). The MEMOPAK 32K and the MEMOPAK 64K offer large memories at economical prices.

16K: £29.90
32K: £49.95
64K: £79.00
inclusive of VAT



MEMOPAK Centronics I/F
The BASIC commands LPRINT, LLIST and COPY are used to print on any CENTRONICS type printer. All ASCII characters are generated and translation takes place automatically within the pack. Reverse capitals give lower case Additional facilities allow high resolution printing.
£39.90 inc VAT

ZX81

It all adds up to an efficient, modular computer system

The **Memotech** approach to microcomputing is to take the well-proven and popular ZX81 as the heart of a modular system. This small computer houses the powerful Z80A processing unit and acts as the central processor module through which the **Memopaks** operate.

Memotech has a reputation for professional quality, producing units which are designed to fit perfectly, to look well-balanced, and to work efficiently and reliably.

The modular approach gives ZX81 owners the freedom to design the system they really need. Furthermore, the intercompatibility of the modules ensures that later additions will click straight in, to give you a system that grows with your ambitions and abilities.

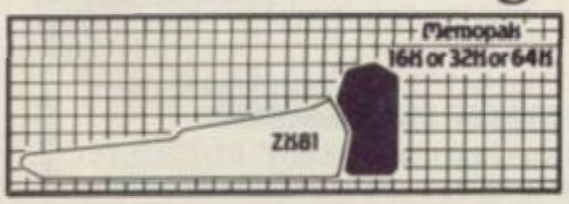
To ensure that your expectations are realised, care is taken at every stage to design features into the system to anticipate your needs. For example:
1) Memories are cumulative e.g. 16K and 32K can be added to the **Memopak 16K** or even to the Sinclair 16K RAM pack. 2) The **HRG** firmware allows commonly used constructions (such as scrolling, shading and labelling graphs), to be called by a few simple commands. 3) The **Centronics I/F** converts ZX81 character codes into ASCII and extends the print line to the width of the printer, still using the LLIST, LPRINT and COPY commands.

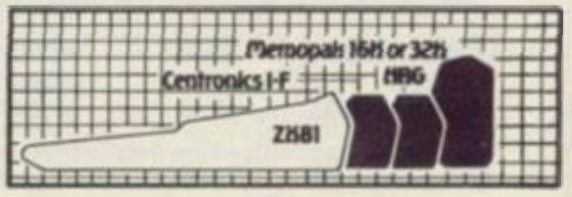
As one example, a system with 16K of memory and **Memocalc** is all that is required to perform the same sophisticated numerical projections as a computer at 10 times the price. The problem may be as complicated as a cash flow or production schedule, or as simple as household accounts or pocket money budgeting. If your bank manager wants to see a cash flow, then a single print instruction to the **Centronics I/F** will give a printout which is more than acceptable.

The example system which is shown, on the other hand, would satisfy the needs of someone who wanted to enter data

How it all fits together

You can see from the diagrams how various Memotech/Sinclair units can be combined.





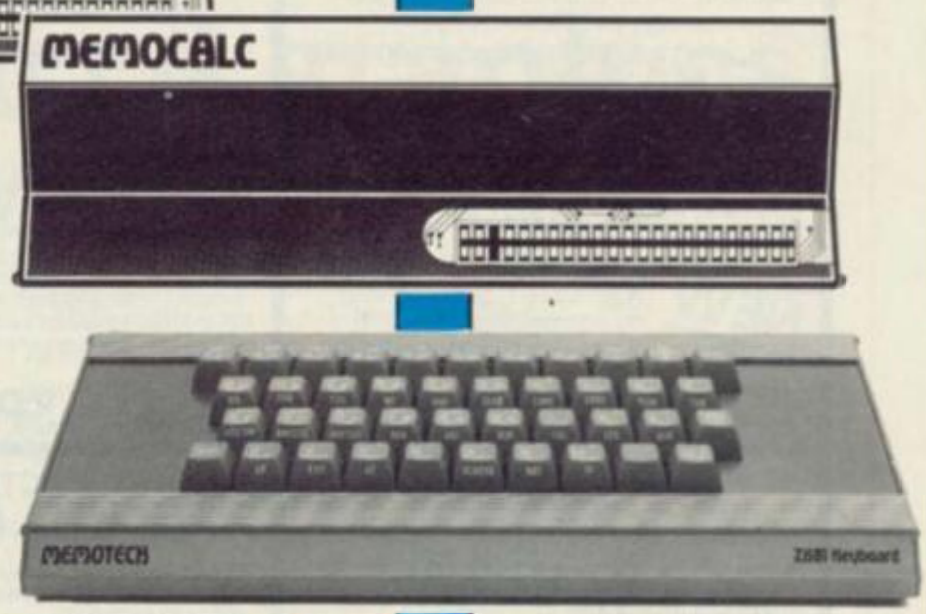
otech,
tial of your ZX81...

MEMOPAK HRG This pack breaks down the constraints imposed by operating at the ZX81 character level and allows high definition displays to be generated. All 248 × 192 individual pixels can be controlled using simple commands, and the built in software enables the user to work interactively at the dot, line, character, block and page levels. Scrolling, flashing and animation are all here.

£39.90 inc VAT

MEMOCALC The screen display behaves as a 'window' on a large sheet of paper on which a table of numbers is laid out. The maximum size of the table is determined by the memory capacity, and with a MEMOPAK 64K a table of up to 7000 numbers with up to 250 rows or 99 columns can be specified. Each location in the table can be either a number which is keyed in or a formula which generates a number.

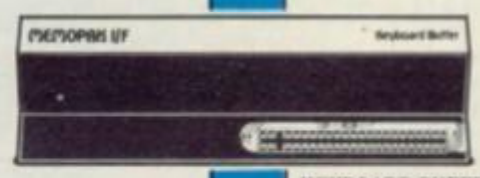
£29.90 inc VAT



MEMOTECH KEYBOARD

The Memotech plug-in Keyboard plus buffer pack takes the effort out of data entry for ZX81 users. The Keyboard has a light professional touch and is housed in an elegant aluminium case. The simple plug-in system means that you are not obliged to open up your ZX81, use a soldering iron or invalidate your ZX81 warranty.

£49.95 inc VAT



KEYBOARD BUFFER PAK
The Buffer Pak performs a "housekeeping" function for the Keyboard, interfacing directly with the port at the back of your ZX81.

via a light-touch keyboard, construct and label graphs, and then copy the screen to an 80-column printer. Only 16K of memory is shown here but with additional memory, more than one video page can be stored. Up to 7 pages can be displayed in rapid succession to give animated displays.

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SU 3

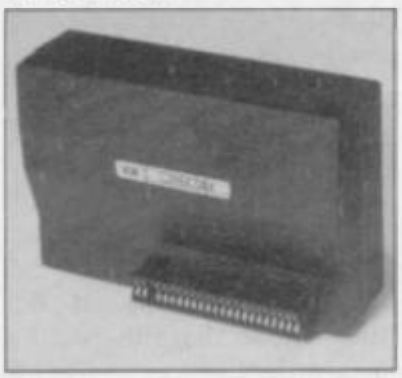
Non-wobble RAM pack

CHEETAH MARKETING has produced a 16K RAM pack for the ZX-81 which stops any RAM pack wobble without using glue, tape or screws. The front has been contoured to fit the curved back of the ZX-81 and fits it like a glove.

Vigorous tests were carried out, such as thumping the keyboard heavily, but it refused to crash. The cost is £19.75 inc.-VAT and postage.

Cheetah also makes a 64K RAM pack for £44.75. Printer owners may be pleased to know that it also works well with the Sinclair printer.

Cheetah Marketing is at 359 Strand, London WC2. Tel: 01-240 7939.



Advanced graphics from Memotech

MEMOTECH has been producing RAM packs for some time but also produces a keyboard for the ZX-81 and a hi-res pack. The keyboard does not require the user to dive into the machine to fit. Its interface module goes into the back of the ZX-81 like all the other modules and the keyboard is on a 7in. cable emerging from the end of the metal box. It provides only 40 keys — no space bar — and the keys tend to echo inside the box, but it works well. It would be very useful to the non-technical user and does not invalidate the guarantee.

The hi-res pack — HRG — requires the use of at least a 16K RAM pack in which to store its high-res pages. Depending on the size of memory, more than one 6,337-byte page can be stored. The pages must be stored outside the normal memory above RAMTOP.

The routines to control the screen are in a 2K EPROM from 8K-10K and use certain reserved Basic variables to transfer information to the routines. Twelve variables are required to be set up to make full use of the system; one of the Z$ is used to contain one of 30 commands.

The screen must first be set up by allocating variable V to the start of the video page, Z$ to "STARCH" and calling the user routine via RAND USR 8912. That then sets up the screen, clears it and changes the screen from the Sinclair version.

You can then see only the hi-res screen, no INPUTs or commands are visible, and PRINT, PLOT and the like will appear on the Sinclair screen. To return to the Sinclair screen you must either press the black button on the side of the hi-res unit or set Z$ to "Basic" and call the user routine again.

All commands are given in

continued on page 26

ZON X for Spectrum

BI-PAK has now made the ZON X-81 sound box available for the Spectrum as well as the ZX-81. It contains an 8912 three-channel sound chip with a powerful amplifier, loudspeaker and volume control in a 6in. × 3in. × 2in. black box. Everything is powered from the computer and some complicated sounds can be generated which will repeat without the aid of the computer.

As the device is I/O-mapped it requires machine code on the ZX-81 but an ingenious method of making it compatible with other REM-located machine code makes it easy. The Spectrum must use an additional board which contains a 3.5MHz oscillator to stabilise the frequency used. That is about 2in. long and fits between the Spectrum and the ZON 81.

One problem with the decoding makes it incompatible with the Microdrive and RS232 intended for the Spectrum as it uses A4, which Sinclair has already declared will be used by its devices. Apart from that it works well on both machines, providing a cheap and easy alternative to the BEEP command.

Bi-Pack sells the ZON X for £25.95 and the Spectrum board for £6.80. Bi-Pak is at PO Box 6, 63a High Street, Ware, Herts. Tel: 0920 3182.

continued from page 25

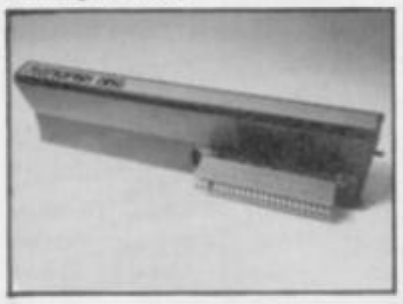
that way through the same USR call. X and Y variables determine the plot position, X being in the range 0-247 and Y is 0-191. Lines can be drawn from point P/Q to X/Y using "LINE";"UNLINE" unplots them.

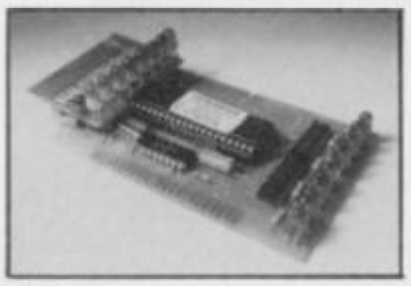
It is a useful device but one which is not easy to learn to use. Many variables have to be set and re-set during the program for it to work. Error codes are given but things like the scroll commands can crash the system if they are not used properly.

The casing is stylish and strong and Memotech includes Velcro strips to stick the packs to the ZX-81 to stabilise them. All the Memotech packs are moulded to fit the back of the ZX-81 and each other.

The Memotech keyboard costs £49.95 and the HRG pack £39.90. They can be purchased from Memotech Ltd, Witney, Oxon OX8 6BX. Tel: 0993 2977, or from larger W H Smith branches.

Memopak HRG





32-way port for Sinclairs

EPROM SERVICES produces a 32-way port for the ZX-81 or Spectrum which has LEDs to indicate the state of its outputs. The device is based on an 8255 chip which is I/O-mapped to give 24 lines. One of the outputs is then fed to a set of eight flip-flops which produce the other eight lines.

A flip-flop gives two outputs which are always the opposite of each other, so if one is 0 the other is 1. That allows you to drive more devices but does not give more than 24 controllable two-state lines.

One of the facilities provided is for using the port to select other devices.

The PCB has no edge connector, so it has to be used with a motherboard or back-to-back connector.

Eprom Services is at 3 Wedgewood Drive, Roundhay, Leeds LS8 1EF. It charges £15 for the port and £24 for a motherboard for the Spectrum.

New company goes hi-res

A HIGH-RESOLUTION graphics pack designed to work on a ZX-81 with at least 8K of memory is the G007 produced by the Nottingdale Technology Centre. By extending certain commands in Basic such as SLOW, FAST, CLS and PLOT it gives the ZX-81 a 256 × 192 dot screen — it is slightly bigger but to keep the calculations simple it is limited to that.

The extra number at the front of the commands gives access to the extra commands, i.e., CLS 3 inverts the whole screen without clearing it. The routines available allow the plotting of individual pixels on the screen, drawing lines, triangles and parts of circles, as well as shading them.

PRINTing may be done to any pixel on the screen as the PRINTing corresponds to the graphics pointer. That enables you to print a character, number or letter at any place on the hi-res screen. The SLOW command determines whether it is printed in black or white and what the background will be.

The use of the hi-res screen is enhanced further by the fact that the edit line is constantly on the screen, so INPUT and commands can be given without having to switch backwards and forwards between screens. Both the Sinclair screen and the hi-res version are separate and so clearing one will not effect the other.

Both screens can be SAVEd, LOADed and COPYed from Basic. The hi-res screen is stored as the last program line — line G007 — and can be deleted only by a USR routine. The Sinclair Basic will not allow you to SAVE it as a named program, however, so LOAD"" must be used to get it back.

The program is stored in a 2K (2716) EPROM inside the unit and uses the internal memory of the ZX-81 — 1K or 2K — to store its system variables. All of those are described in the manual with the unit, so that the machine code programmer can also use them. There are three example programs, only one of which failed to work.

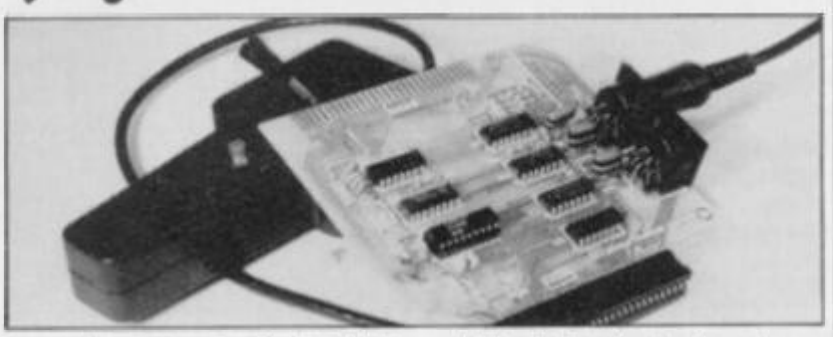
The device goes directly on to the back of the ZX-81, as it has to decode the internal memory into using the 8K-12K section of memory on the ZX-81. That means it could be incompatable with some ZX-81 RAM packs or add-ons. Using it is very easy, as one soon becomes used to adding the extra numbers — they are all fully syntax-checked too — and the display is rock steady.

Perhaps the next project for the group will be a colour board, as it would make it a very cheap BBC machine, but using only 6K of memory for the screen. To order the device, send £37.55 to Nottingdale Technology Centre Ltd, TFL (ZX-81), 189 Freston Road, London W10 6th. Tel: 01-969 8942.

Analogue joystick board

MIDWICH has produced an analogue joystick board which fits both the ZX-81 and the Spectrum. It can take two joysticks by plugging them into two six-way DIN sockets on the side of the bare board. It is input/output-mapped and requires the use of a small section of machine code on the ZX-81.

The board uses a ZN499E A/D converter and a switch to select which direction to measure. The results vary from 0 to 255 for each direction on the joystick —N/S and E/W — and the "FIRE" button operates one bit each of a second port, one giving 0 or 128 and the other 0 or 64; the higher number indicates that the button is pressed. Both pressed gives 128 + 64 (191).



Inserting the power plug is difficult, as not sufficient space has been left between that and the joystick sockets on the Spectrum version.

Midwich sells the board as a kit for £17.20 and assembled for £22.95. The joysticks cost £4.50 uncased with fire button. The kits are well-designed with good instructions. Midwich Computer Co Ltd, Rickinghall House, Richinghall, Suffolk 1P22 1HH. Tel: 0379-898571.

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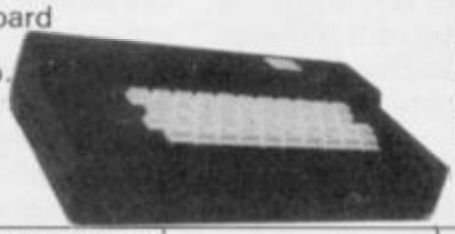

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New and varied life-forms now inhabit the Pacman maze. John Gilbert investigates.

Leading the Pac

PACMAN is part of what the video historians like to call the arcade maze craze. The game is set in a maze where a hungry little round creature eats dots and power pills scattered through the corridors. The monsters are ghosts which hunt the little man and will eat him if he is not agile enough to escape.

If, however, the Pacman eats a power pill it can chase and eat the ghosts. The original game was introduced to the home computer market by Atari, primarily on its VCS video system and then on the 400 and 800 computers.

The first versions for other computers, variously called Puckman, Gobbleman and Scoffer, arrived shortly afterwards and since then new versions have been released almost every month.

Not surprisingly, the ZX-81 did not escape the craze. The authors of **Zuckman,** from DJL Software, claim that it is the first version of Pacman for the ZX-81. The game runs in 16K and is written in machine code, which gives the scrolling routines and Pacman a smooth movement. That is something unusual on the ZX-81, as most games flicker slightly.

The game adheres as closely as possible to the original and the limited graphics of the ZX-81 do not matter much. One snag with playing the game on the ZX-81 is the membrane keyboard. Moving a Pacman around the screen using it can be difficult but not impossible.

At the beginning of Zuckman the ghosts speed on their victim and if you panic trying to find the keys and do not press them properly you are liable to lose a Pacman or crash the machine. Once you have a fair idea of the game, however, it is surprising how quickly you can move the Pacman around.

Zuckman is available for £5.95 on the 16K ZX-81 and Spectrum. **Super Glooper** is a version of Pacman, also for the 16K ZX-81, which is retailed by Sinclair Research. Glooper's task is slightly different from normal. Instead of gorging himself with power pills he has to paint the maze. Obviously the ghosts will not tolerate Glooper's antics — perhaps they do not like the smell of paint. The ghosts will try to kill Glooper as usual but if he can get round the maze and paint all the walls you have won.

The game is very amusing and is well worth £4.95. The program will load in less than two minutes, so you will not have to wait six minutes to play the game.

The launch of the Spectrum provided software houses with an excuse to try to produce the perfect Pacman which simulated the Atari version as closely as possible but Atari guards its rights over products jealously and investigated the products of several firms in the ZX industry.

The Abbex **Spookyman** game is the most famous of the Spectrum versions. It also looks most like the original. Most games, until now, have included only dots and power pills in the mazes. Abbex has included dots, power blobs, diamonds, hearts, clubs, mean-looking ghosts and a cute little Pacman which looks like a diamond turned on its side.

The keyboard is divided into three sections with left control on the left, right on the right, and up and down in the centre. The controls are very difficult to master but, once you have done so, usually with the aid of both hands, you will be surprised at the agility you can attain.

At times the game is almost impossibly fast but Abbex estimates that the highest score possible after every screen has been cleared is 22,400. If you manage to reach 10,000 points you will receive a bonus life. We managed to go that far only once.

Spookyman can be played by one or two players. If two play they take turns to control the Pacman. Their individual scores and the highest score are included at the top of the screen.

There are two unusual features in Spookyman. The first is that you can re-set the high score at any time between games; the second is that you can use a joystick. The game is compatible with the Kempston joystick and once you have seen it in action it is almost a necessity. Spookyman is available from Abbex and costs £4.95.

Gulpman is another variation on the Pacman theme. The round Pacman is replaced by a little man

running round the maze and the ghosts become frowning faces which smile only when they have caught Gulpman.

The game is very complex and you can switch to any of 15 mazes in which to play. It is also possible to change the tempo. At tempo one the speed is bearable but at tempo 10 life is not worth living.

The little man can fight back slightly more easily than in other games as he approches with a fully-loaded laser gun. If the ghosts get too close you can blast them away but only until your energy runs out. It seems as if the space age is over-running everything. Gulpman is available from Campbell Systems and costs £5.95.

Hungry Horace, from Sinclair Research, has developed a reputation as a fun game; in fact Horace is almost a legend. The game is a great improvement on the original and has remained at the top of the software top ten for some time.

Horace is a large purple blob which has sprouted arms and legs. He wanders around the maze which looks like a park, eating everything in his path and trying to avoid the guards who act like ghosts and try to capture him. He can scare away the guards by using the alarm bell situated somewhere in the maze.

If Horace reaches the exit of one of the mazes he can enter the next maze and continue to the next exit. The mazes become more difficult as Horace proceeds further in his adventure and we managed to reach only the third maze. With a large amount of skill, however, it should be possible to go further.

Hungry Horace, for the 16K Spectrum, is available from Sinclair Research and costs £5.95.

Although the arcade industry in the States, and now in Britain, is declining it is good to see that games concepts like Pacman are being transferred to micros.

Some of the Sinclair versions of Pacman seem as good as, if not better than, the original Atari version. Games such as Hungry Horace are setting-up an interesting mutation in the Pacman concept. They also seem more interesting than the original version because they have added to the idea of Pacman. So far as the consumer is concerned it is to be hoped that concepts such as Pacman will not be destroyed within the industry.

DJL Software, 9 Tweed Close, Swindon, Wilts, SN2 3PU.
Sinclair Research, Stanhope Road, Camberley, Surrey, GU15 3PS.
Abbex Electronics Ltd, 20 Ashley Court, Great North Way, London, NW5.
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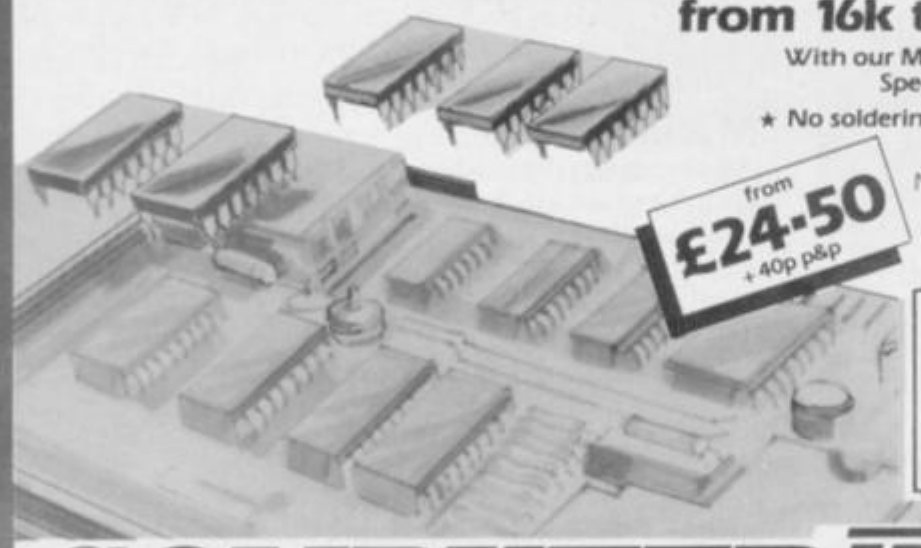

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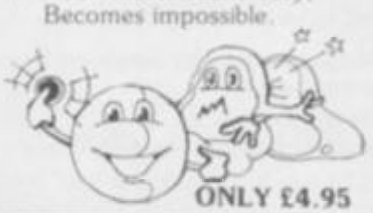

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Profiting from sailing the ZX-81 China Seas

LIFE on the China Seas can be exciting, so long as you do not owe money to the moneylender in this game for the ZX-81. **Taipan** appeared originally as a program in *Sinclair User* but now the author has decided to retail it.

The object is to sail round the ports of Hongkong, Singapore, Macao, Bangkok and Shanghai, to earn money from the sale of goods to the populace. Some of the cargos you will carry are strange and exotic, including general goods, arms, silk, opium — and even women.

The game takes account of three ranks of trader — beginner, experienced trader and financial wizard. We do not know of anyone who has reached the financial wizard stage without owing plenty of money to the wicked Chinese moneylender, Sum Yan. One of the troubles of being a trader is that Sum Yan may send some of his 'boys' to beat the money out of you.

When the buying and selling has finished at one port it is possible to go to another using the Quit command. The prices of goods there may be higher than at the port you have left and you may make plenty of money.

As you travel from one port to another the interest on the money owed to Sum Yan increases, so it is a good idea to return to your home base of Hongkong and pay back some of it.

The promise of money and power in China proved false for us because we were never out of debt. That ensured that the game attracted some new addicts.

Taipan is available from Jaysoft, 6 Wentworth Drive, Bishop's Stortford, Herts. It costs £4.95.

Addictive frogger

FROGGER is an arcade game which has caused a good deal of interest among Sinclair users and the software industry in general. The attitude seems to be that if you are a big software house you must have a version of this amphibious game.

The version produced by DJL Software for the 16K ZX-81 is a good example. The frog hops across the road and then across the river to the safety of the home enclosure. When the last jump is made a large smiling frog plops into view on the far side of the river.

The dangers facing the frogs and their offspring include the cars on the road and the logs, turtles, diving turtles and alligators of the river.

There are five frog homes to fill but a player can score points just by moving a frog forward. You have three to move and if one is hit by a car or drowned you lose a frog. If, however, you manage to get one home safely you will get an extra hopper. If, by some miracle, you get 5,000 points, you will be given an extra life.

Frogger is very addictive and the membrane keyboard in no way hampers play. The program can be obtained from DJL Software, 9 Tweed Close, Swindon, Wilts., SN2 3PU. It costs £5.95.

Adventure innovation

THE BLACK CRYSTAL is one of the first graphic adventures for the 48K Spectrum and 16K ZX-81. The plot of the adventure, which is played in six parts, is to destroy the evil **Black Crystal** with its malign intelligence before you are destroyed by the Lords of Chaos.

To do so you must get through six maps on which you can move your little player, using the cursor keys. On the first map you must find some rings of power to enter the castles on that map. When you find the rings you may go through the door of the Castle of Shadows or into the dark domain of Shaggoth's Lair.

You must struggle around hidden mazes, fight dragons, and avoid deadly mists. The final conflict is between you and the Lords of Chaos. If you win you will destroy the Black Crystal and peace will reign in the land. If you fail, you and the inhabitants of the land will be doomed to eternal torment.

The Black Crystal is an excellent graphics adventure and

continued on page 36

Roman empire building

SIMULATION of ancient wars between old-world empires has become a speciality of the software house M C Lothlorian. **Roman Empire,** for the 16K Spectrum and ZX-81, is the new Lothlorian product. The game is set in the first century BC. As Emperor of Rome you have to conquer six hostile countries. Those countries are regarded as hostile because you do not rule over them.

At the beginning of the game you are given five generals, each with an army under his command. The armies are your ticket to absolute power. As well as the five armies you also have 10 legions, each comprising 5,000 soldiers. From those legions you can stock your armies in such a way as to make sure you will be the conqueror. The way in which you distribute the legions is an important factor in winning the game.

There are three levels of play, ranging from difficult to impossible. We have managed to keep our power-base only in the first two levels. When you have entered the level of difficulty you must build your armies and send them against the countries of you choice.

Matching armies is a skill which is not acquired easily. If you put the wrong army into an area which contains an enemy army of greater strength you will be eliminated. Roman Empire costs £5.50 for the Spectrum and £4.50 for the 16K ZX-81 from M C Lothlorian, 4 Granby Road, Cheadle Hulme, Cheadle, Cheshire SK8 6LS.

continued from page 35

a well-though-out package. There are two cassettes in the box and an introductory booklet giving the history of the Black Crystal, as well as instructions and hints on play.

The game has good quality graphics. The Black Crystal is available from Carnell Software, 4 Staunton Road, Slough, Berkshire. The package is reasonably priced at £7.50.

Spectrum compiler

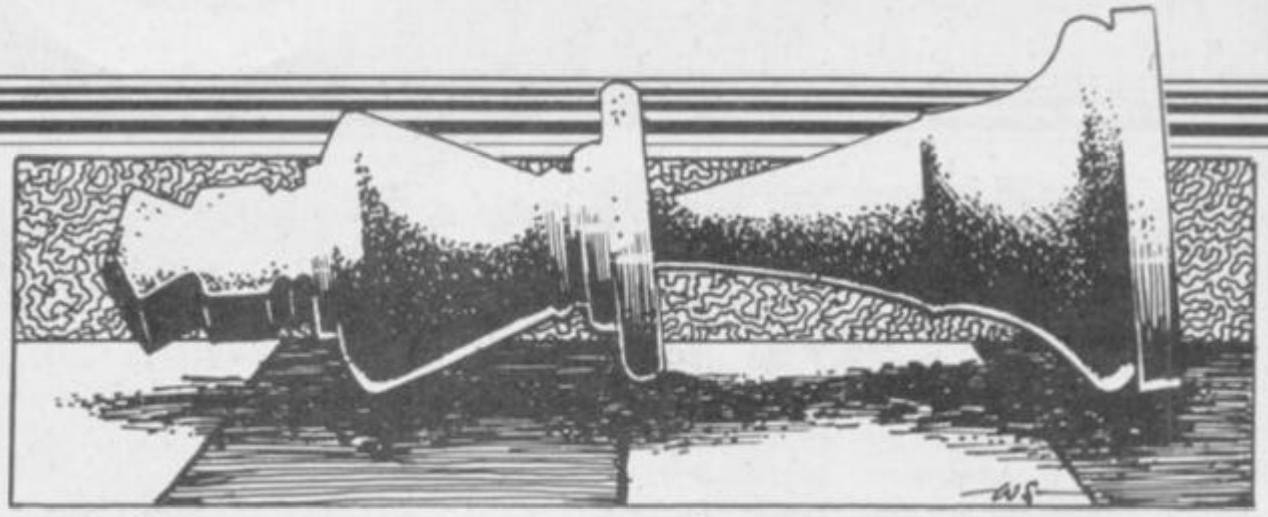
MACHINE CODE compilers are starting to creep on to the Sinclair scene. The Softek compiler for the 48K Spectrum is called **Super C.** The manufacturer claims that the code compiled from Basic into machine code will run faster than many other languages, including Pascal and Forth. The program will compile approximately 90 percent of the Basic language commands.

The problem newcomers to machine code may have is how to use arrays and variables within compiled programs. The compiler cannot handle string or numeric variables or arrays.

If the user knows something about machine code the situation can be remedied by setting-up a data area in memory with all the variable values set in it.

Super C has an instruction booklet which includes tips for modifying Basic programs to run without using statements which cannot be compiled. Compiled programs can be run easily by typing RUN instead of having to worry about RAND USR.

The compiler is useful in programs which use animated graphics but, until Softek produces promised modifications, the program may prove difficult to use for some beginners. The Super C compiler costs £14.95. It is available from Softek, 329 Croxted Road, London SE24.



Mikro Gen chess helps to defeat itself

MASTER CHESS, from Mikro Gen, is one of the best chess programs available for the 48K Spectrum. The game allows the user to play at one of 10 levels, numbered from zero to nine. The computer will respond with its move almost immediately in mode zero but the computer move in mode nine can take several minutes.

If a player is stuck in a position, the computer will suggest a move. In effect, the computer will recommend to its opponent the best move to make against itself, which shows that computers have no brains. The program also allows you to set up the board before playing the rest of the game.

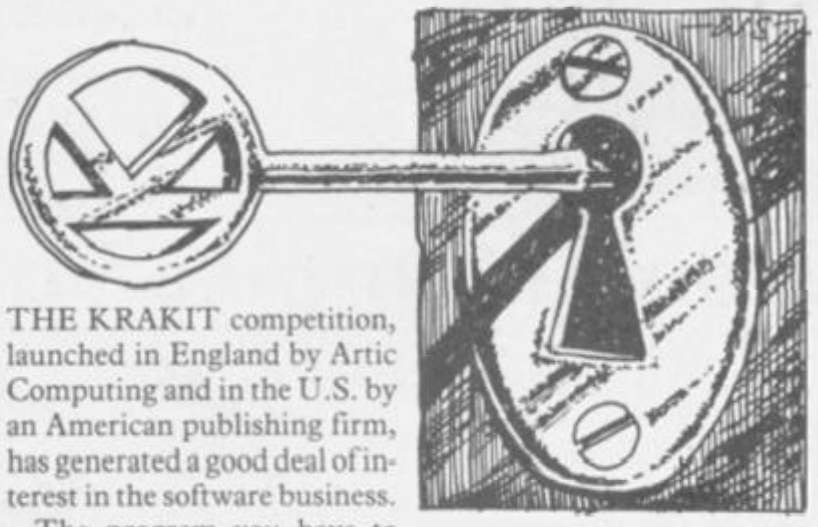
The board can be cleared and a flashing cursor will appear on one of the board squares. Entering the appropriate letter, for example 'p' for pawn or 'k' for king, will make the computer place that piece on the square with the cursor.

When the board is set up with all the pieces in the order the player requires, the game will continue after selection of colour and level number.

A record of the moves made is kept on the left-hand side of the screen. If the player makes an illegal move the computer will not permit it and if the player wants to make another move instead of the one last entered, that move can be deleted.

The game is capable of pawn promotion and *en passant* and is one of the best versions of chess for the Spectrum. **Master Chess** can be obtained from Mikro Gen, 24 Agar Crescent, Bracknell, Berkshire. It costs £6.95.

Code-cracking wins contest



THE KRAKIT competition, launched in England by Artic Computing and in the U.S. by an American publishing firm, has generated a good deal of interest in the software business.

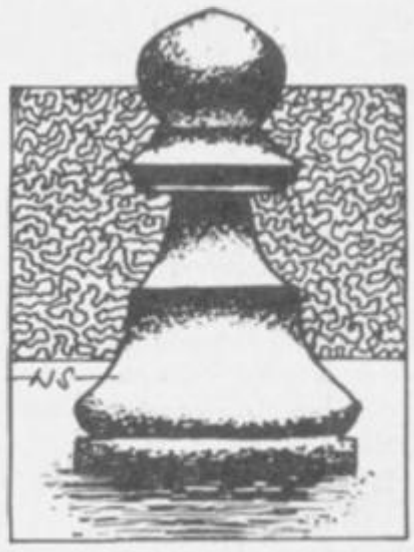
The program you have to buy to enter the competition is different from any other we have reviewed, because it lists only a series of riddles and allows you to store the answers which you have for them.

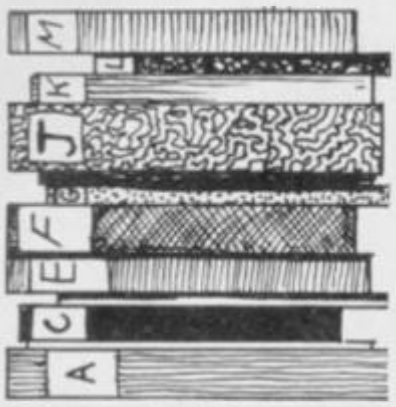
The ZX-81 version is loaded in two parts. The rules are given first, along with a fairly impressive graphic animation display of a key turning in a lock. The computer shows a menu to the competition entrant, from which you can find how to fill in the entry card you receive with the package, see an example riddle and how it is solved, or go to the second part of the program which lists the riddles.

The second part reveals the 12 clues. The entrant will need to find the name of a country, a name for a town and a number.

We looked at all the questions and the easiest seemed to be question two which, with a little help, we think we have solved.

Krakit is available from Artic Computing, 396 James Reckitt Avenue, Hull, North Humberside. The program is available for the ZX-81 and the Spectrum at £9.95.





Campbell masterfiles Spectrum

ANYONE who has used **The Fast One,** a filing system for the ZX-81, and has now upgraded to the Spectrum will be pleased to hear that Campbell Systems has a similar program, **Masterfile,** for the 48K Spectrum. The author describes the program as a business and domestic filing system which allows files to be SAVEd and LOADed independently of the program.

The program is menu-driven. Files are made up of records which can be designed in any way the user chooses. Each record can contain up to 26 items of up to 128 characters for each item.

There are several options which allow the user to manipulate a file or a record. They include searching by character or numeric value, updating or copying a record, totalling or averaging items, and erasing records.

If a user has special requirements the program can be tailored to suit through the User Basic option. The program is also open-ended. That means a Microdrive option can be written into it.

On average, there is 32K of memory space available for data storage. That makes the system ideal for business use so far as memory is concerned but for full advantage the program needs to be run with a mass storage device, such as the Microdrive, with fast access to large amounts of data.

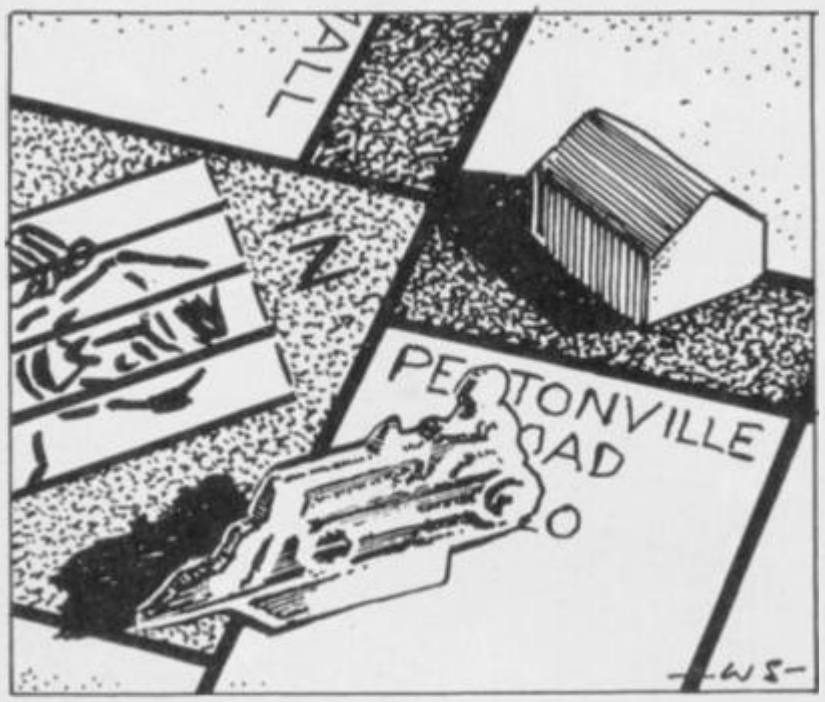
Masterfile is available from Campbell Systems, 15 Rous Road, Buckhurst Hill, Essex, 1G9 6BL. It costs £15.

Work Force fun

SOFTWARE HOUSE Work Force has produced three very entertaining games and one very helpful toolkit package for the 16K and 48K Spectrum.

Base Invaders is one of the most addictive space invader games we have reviewed. It is difficult to beat, unlike some other games we have received in the last few months. The authors have also included a shield for the laser bases at the bottom of the screen which can be activated if the going becomes difficult. **High Noon** is the best version of Shoot Out we have seen either for the ZX-81 or the Spectrum. The animation achieved as the two gunfighers try to shoot down each other among the cacti and the wagons is very smooth. The game can be played with a human opponent or with the computer. Both games are for the 16K or 48K Spectrum.

Do Not Pass Go is a version of that popular board game over which Waddingtons seems to have a Monopoly. The game is the same in most respects and the computer acts as the banker, debt collector and property broker. The computer will allow two to six players to try to find the road to riches — or rags as the case may be. Do Not Pass Go is for the 48K Spectrum.



The toolkit for the 16K and 48K Spectrum is called **The Programmer's Dream.** It will re-number programs, move blocks of lines to other parts of a program, erase one line or blocks of lines, change the values of strings in a program, list variable names and contents of a program, and display the size of a program and the amount of memory used to store variables.

The program is ideal for Basic program development work and works like a dream.

Base Invaders and High Noon are available for £4.50 each. Do Not Pass Go costs £6.95 and The Programmer's Dream £6.95. All can be obtained from Work Force, 140, Wilsden Avenue, Luton, Beds.

Making beep music

MAKING MUSIC from the Spectrum BEEP command seemed almost impossible a short time ago but now PDQ Software has a package called **Spectsound** which will turn the computer into a mini electronic organ.

The package, for the 48K Spectrum, contains a cassette, an instruction booklet, and a keyboard overlay. The overlay shows the notes which can be generated; the keys to switch to an octave higher or lower; and operation keys to generate random notes; delete notes; change the duration of a note; delete the whole tune in memory and play the tune so far in memory. The sound from the Spectrum is not amplified in any way using the package but the introductory booklet provides the user with ideas how to increase the output.

It is possible to store tunes and to load them back into the Spectrum. It is also possible to display the numbers which correspond to the BEEP statements necessary to construct the tune in a separate program.

Spectsound is excellent value at £5.95. It can be obtained from PDQ Software, Parsley Rye, Hilders Lane, Edenbridge, Kent, TN8 6JU.

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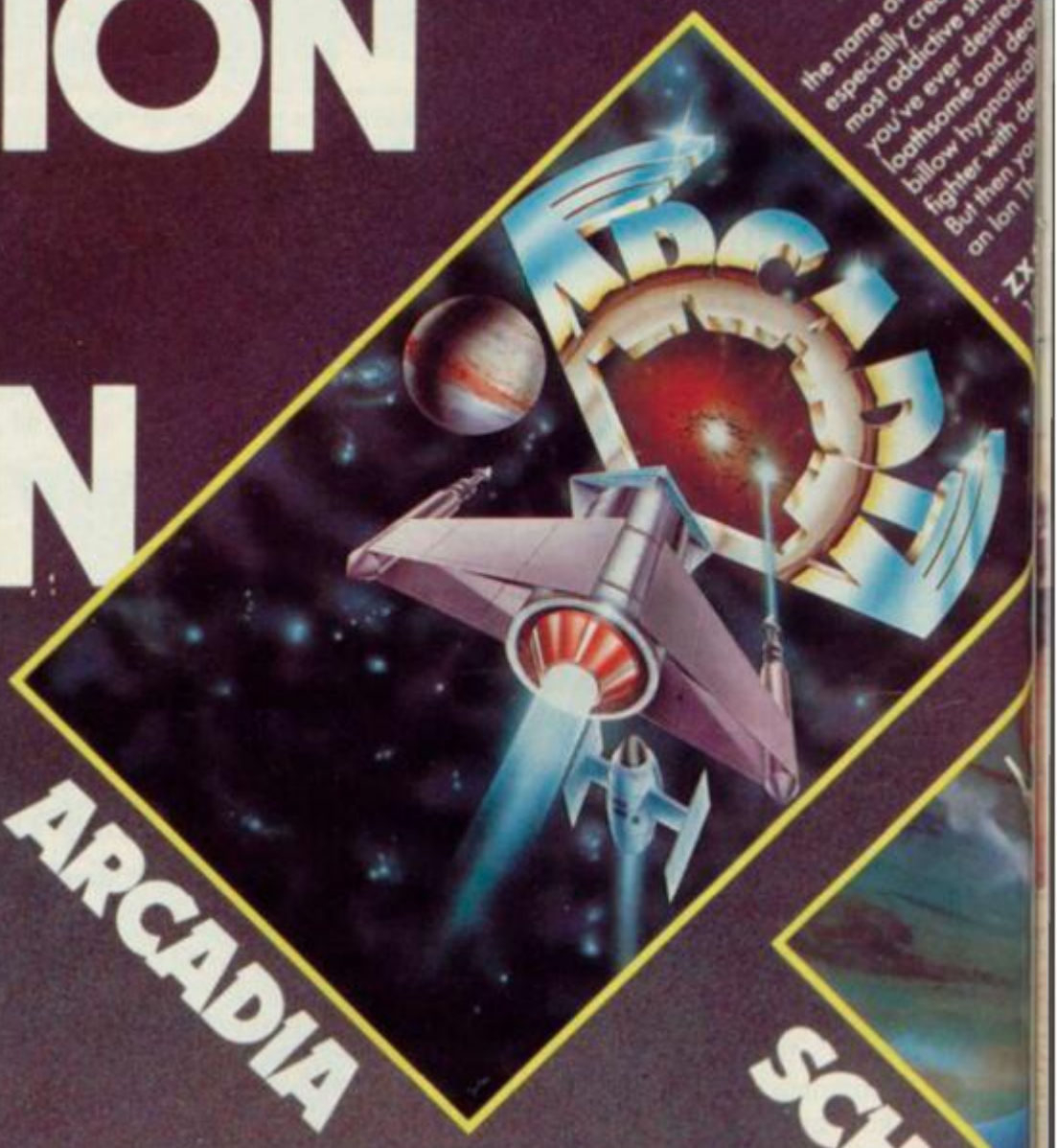

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the trays, the rods, and all the rest.
But they didn't say I'd have to stop and control not just one but two
or even more garbage pods. Then prod them, push
them, toward that black hole, and oh, it's so very, very
black, and so lonely, so empty.
Panic, mustn't panic, but they won't stop, twirling and
spinning and turning, always turning, towards me, against
me, at me. And I'm alone.
No way out, nowhere to hide, on my own; my own . . . own . . .
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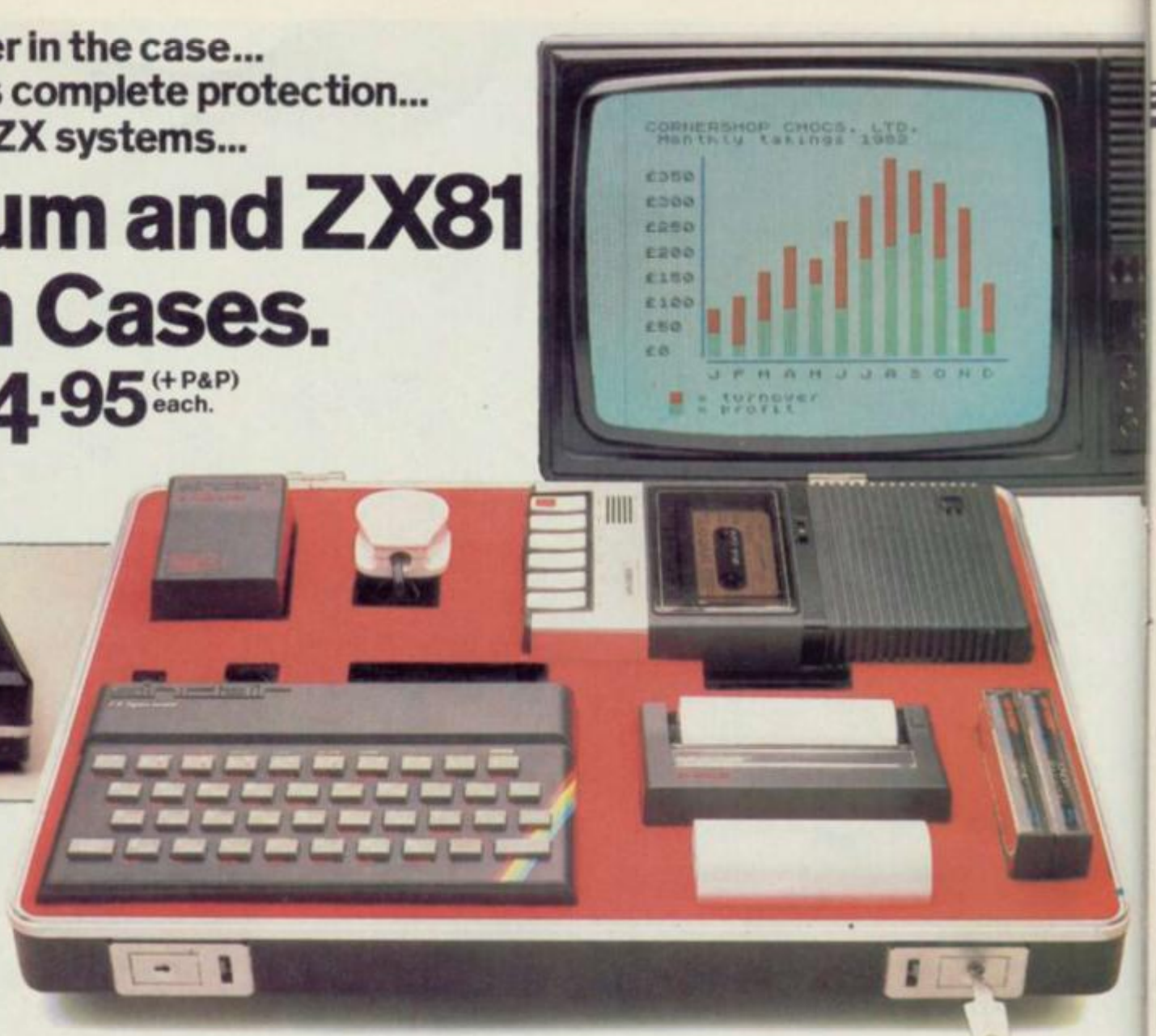

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GLOSSARY

Basic — Beginners' All-purpose Symbolic Instruction Code. A programming language resembling English which is used by beginners because most popular microcomputers have it as standard.

Bug — an error in a program.

EPROM — Erasable Programmable Read-Only Memory. Semi-permanent storage. Information is not erased if the power is turned off in the computer. Programs can be erased by subjecting the memory chips to ultra-violet light. The memory can then be re-programmed using an electrical device called an EPROM blower.

Interface — RS232 and Centronics. A device which enables other computers or add-ons, such as printers, to be connected to the computer. It converts non-standard signals from add-ons to the standard signals of the computer in use.

Kilobyte — (K). A measurement of memory size. Most machines use 16K as a minimum but 48K is generally agreed to be necessary for serious work.

Machine code — an electronic pulse code used by the computer to perform functions and communicate with memory and other devices.

Mnemonics — abbreviated instructions — for example LD for Load — used in machine language programming.

Motherboard — an external printed circuit board which is used like a multi-way plug planner. It enables other printed circuit boards, such as graphics boards and colour boards, to be slotted-in.

Port — a link to the outside world which can be used by programs and the computer.

PCB — printed circuit board. A board which has on it the electronic circuits of the computer.

RAM — Random Access Memory. Information and programs can be stored in this type of memory as electronic pulses which conform to a set of numbers — machine language — in which programs are represented in the computer. When the power is turned off the information will be lost.

ROM — Read Only Memory. Information stored in this type of memory is not lost when the power is switched off.

Software — programs which control the operation of the computer.

Syntax error — a bug caused by incorrect use of a programming language.

Our easy-to-follow guide for new owners

The basic route to a habit-forming hobby

BUYING a Sinclair machine can be the start of a life-time's obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the 48K Spectrum is big enough for simple uses in small businesses, the range of Sinclair computers does not contain machines for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your system. It also makes life easier if you find somewhere to leave your equipment set up permanently: You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television set may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be

continued on page 42

Starting from Scratch

continued from page 41

able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is that important when using the ZX-81 that it is not jolted. Some of the connections can easily work loose and everything which has been entered will be lost.

The manuals are not to everyone's liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities provided by the larger 48K machine rather than providing cassettes for the 16K.

The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and

LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

Usually they occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD "" followed by NEWLINE; then increase the volume of the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then re-wind the tape, the program should LOAD normally.

LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours.

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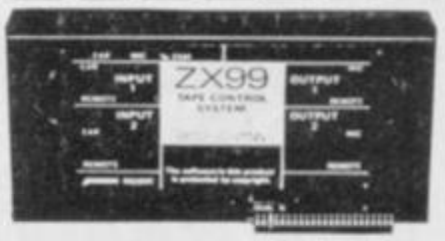

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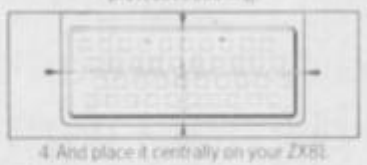
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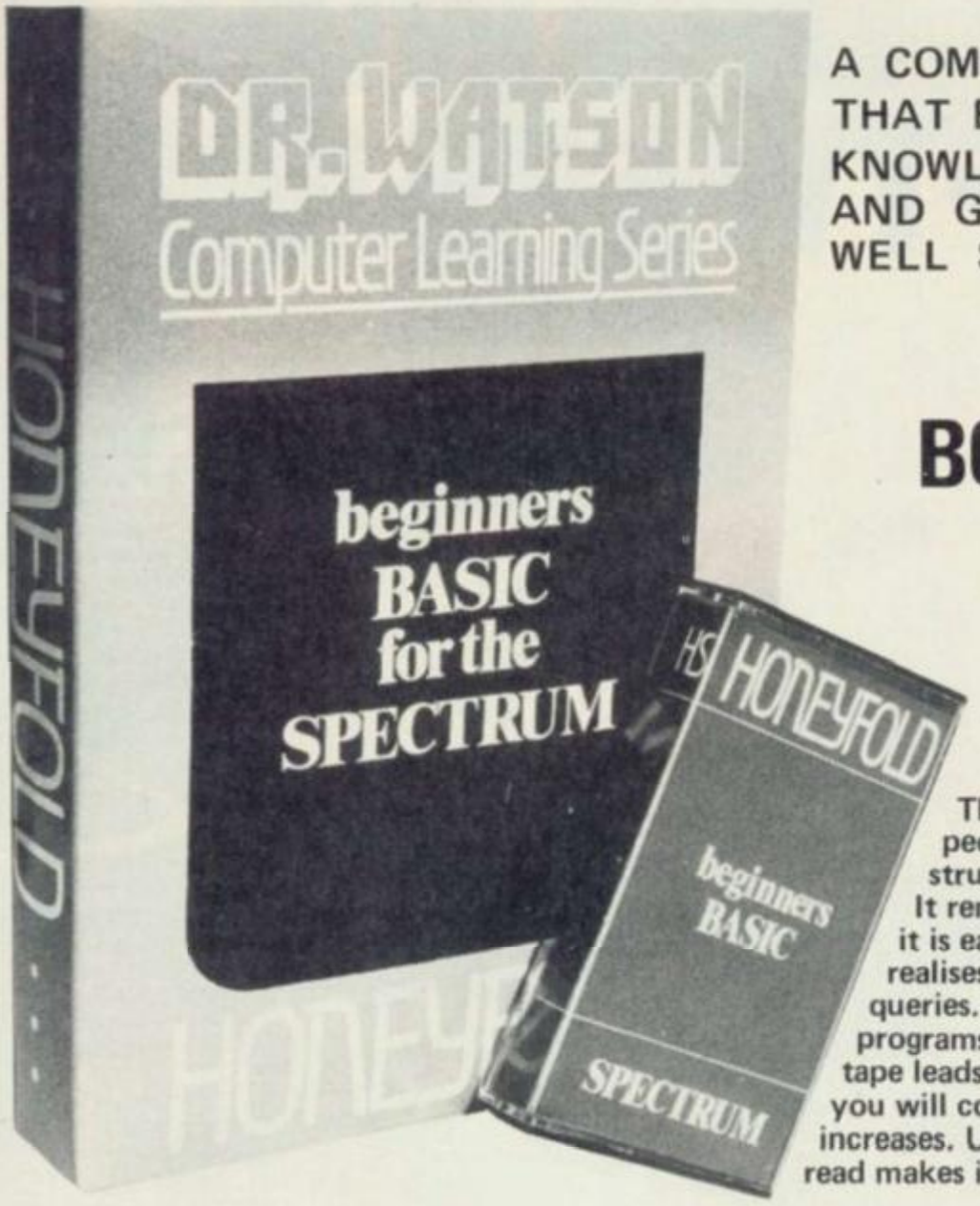

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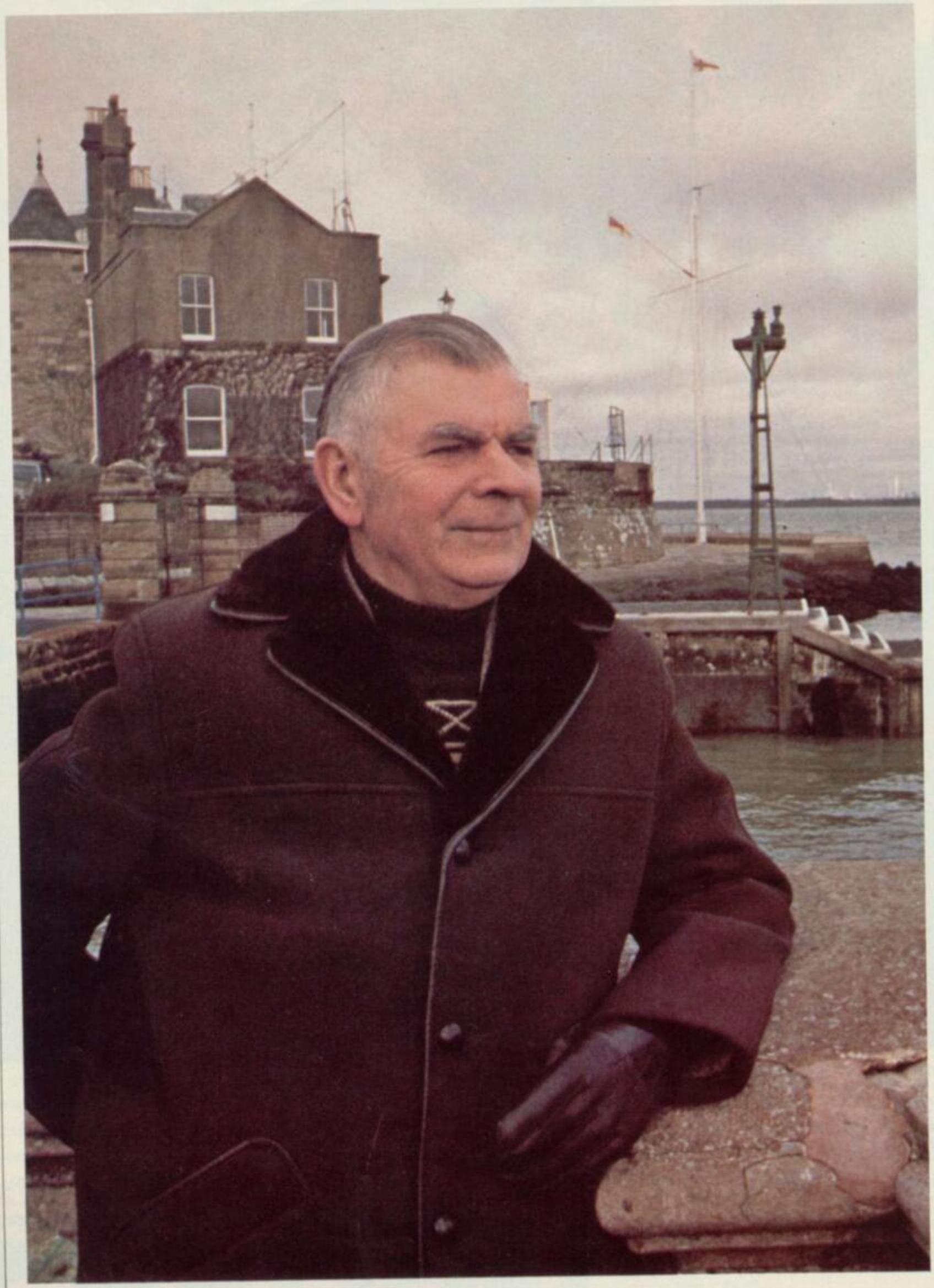

Each month we will interview a notable Sinclair user. Claudia Cooke meets our first User of the Month, a retired shipbuilding manager.

Retiring to the sea, the ships and his Sinclairs

ERIC ANSELL had been looking forward to retirement and the chance of a return to his native Isle of Wight. Two years ago, at the age of 65, he moved into a cottage near the sea at Cowes with his wife, also an islander, and intended to enjoy a quiet life of reading, walking and watching television.

"Never in a million years did I think I would learn something so new at my age", he says. Yet in the six months since his son gave him a ZX-81, he has become hooked on home computers, to the extent that he has just bought a Spectrum and a new tape recorder to go with it.

"My son bought a ZX-81 but then he moved to another computer and when he visited me last summer he asked if I would like the ZX-81.

"At first I wondered what I wanted with a computer. I could not see any use for it. I had no interest in computers and I did not realise how much fun they could be".

Ansell, however, is a man who believes in trying anything. "Once my son had left I started fiddling with it and became absolutely hooked in no time. It is the sheer logic of it which appeals to me," he says.

"You program a game from one of the books and it tells you that you have made two errors. Once you find those errors you realise they are so logical and obvious. It just takes common sense".

He admits it was two weeks before he managed to program a game successfully and he has not yet reached the stage of writing a program.

"When I bought the Spectrum two months ago, I found it much easier to start because I already had some knowledge of the ZX-81 and I have become much faster at typing-in now.

"I used to have two pipes of tobacco in the afternoon and perhaps read a little or watch television. Now I become so engrossed I forget all about my pipe and everything else and I usually spend about two hours, four days a week, with my Spectrum".

Ansell had had contact with computers during his work as naval planning manager with Swan Hunter in Newcastle before his retirement but although he did the critical path diagrams for the computer printouts, his contact was indirect.

"I was always rather dubious about large computers at work. If, for instance, something is proceeding satisfactorily on a ship and you put it through the computer to find the best way, you might have to wait five or six days for an answer but you can go and look at the ship and have it corrected in one day".

He spent 35 years working for a local shipbuilding firm at Cowes before moving to Newcastle when the firm closed. He began his career as a naval draughtsman and then became a chartered engineer before working as a naval shipbuilding manager. He loves ships and everything to do with them and says: "What amazes me about the Spectrum is its ability to produce an almost perfect reproduction of, say, a destroyer, at the push of a few buttons".

> 'Never in a million years did I think I would learn something so new at my age'

Ansell is keen to scotch rumours that computers are for the young, or at least for the under-60s. He sees no reason why that should be so.

"I admit we are not so likely to have contact with them in retirement. I doubt that I should have discovered them if it had not been for my son but I would strongly advise any retired person with a reasonable amount of common sense to buy one straight away and play with it.

"It has given me an interest I never expected to have at my age and my brother-in-law and I spent the whole of Boxing Day together, playing golf with the Spectrum".

It must be said that he is and always has been an avid games player. Apart from being a crossword fanatic, he also subscribes to a weekly puzzle magazine and likes board games, too.

"I remember when my two sons were young, I would buy a new game every Christmas and we would all spend hours with it, sometimes making-up the rules as we went along which, of course you cannot do with a computer", he says.

As for progressing to even more ambitious activities, he is happy with his ZX-81 and his Spectrum, although he says he may consider a 48K Spectrum instead of his present 16K.

The next step, of course, is for him to begin writing programs, something he is characteristically keen to try.

"I realise I need more experience first and I am still enjoying the cassettes I can buy, like Escape and Othello, but I would like to program one or two games and I intend to try soon. I find a great sense of achievement in putting a program on tape and having it correct".

Ansell is a young-looking 67. He wears a smart blue velvet jacket and sits in an armchair within easy reach of a bowl of assorted pipes, as befits any ocean-loving man. On the other side is his Spectrum and across the room there is the presentation tray he received on his retirement from Swan Hunter, listing all the ships on which he worked.

The room is a stark mixture of the old and the new, a combination which Ansell has proved can work well together. All in all, computers have enhanced his life in a way he did not think possible and did not think he desired.

Retirement at Cowes, where he and his wife were brought up, attending the same school and marrying 43 years ago, is something of an idyll and Ansell admits that much as he enjoyed his years in Newcastle, there was never any doubt in his mind as to where he would set up his retirement home.

"I think that had I left the island when I was young, there might not have been the same nostalgia but I was 50 when we moved north and that is just too old to begin putting down new roots".

Now, surrounded by sea, ships and a host of books on both subjects, Ansell and his computers are enjoying themselves thoroughly.

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SINCLAIR USER FEBRUARY 1983

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We meet the people who deal with your queries and complaints. A behind-the-scenes look at the Sinclair mailing house

The go-betweens

SINCLAIR RESEARCH computers are now in a class of their own in the home computer market, which the company has done most to create. Despite its policy of selling many of its products by mail order, however, few of its customers have had direct contact with the company.

The reason is one of its other well-known policies — sub-contracting. As much as possible of the business of making and selling Sinclair products is delegated to outside companies, allowing Sinclair Research to have a very small staff, slightly more than 50 at the moment.

Most people who manage to obtain their machines and software without too much trouble find that the nearest they get to Sinclair Research is a company which works from small offices and a warehouse on a featureless industrial estate in the Surrey town of Camberley.

The offices are those of GSI U.K., the address and telephone number of which appear in Sinclair advertisements and to which the mail order coupons are sent. It is GSI which has the task of being the first line of complaint and query, answering the growing number of Sinclair users throughout the country. It is also the GSI switchboard which plays music to soothe the patient person waiting for a query to be answered.

GSI U.K. is the British subsidiary of a French company which has built a reputation as a supplier of marketing services to the motor trade. It maintains a mailing list for a large number of motor dealers which can be used when a particular group of people need to be contacted. GSI also looks after the despatch of the information.

NIGEL BROWN
In charge of the Sinclair account

With its associates, GSI claims to be the biggest computer bureau for the motor trade in Europe. Its ultimate parent is CIT-Alcatel, a division of CIT, the power generating company which is the private equivalent of Britain's Central Electricity Generating Board.

The expertise for large mailings with a certain amount of mail order distribution led to the company being considered when Sinclair was looking for a distributor.

"We had a good deal of experience with keeping names and addresses on file and mailing, so it was natural to start doing something like the Sinclair work," says Nigel Brown, product manager at GSI, who is in charge of the Sinclair account.

"We started working with Sinclair in October, 1980 when the ZX-80 was still being produced. Before that Sinclair had looked after the distribution and we needed only four people at that stage."

At that time the company was known as Jaserve, changing to GSI when it was taken over in April, 1981.

"With the launch of the ZX-81 in March, 1981 the work became much bigger, which was when I became the account manager, "Brown adds.

Now there are 58 people working exclusively on the Sinclair contract, which has grown to become a substantial

continued on page 52

continued from page 51

part of the British company's turnover.

Every one of the Sinclair products, the range of which now includes two computers — with different versions for the different television and power systems throughout the world — a printer, printer paper and a growing amount of software for all uses, passes through Camberley on its way to the corners of the world.

Each day two large, articulated container lorries make the long journey from Dundee to Surrey with the latest batch of Spectrums, ZX-81s and printers. Another slightly smaller lorry takes more products from the other Sinclair suppliers.

They all go into the large, highly-secure GSI warehouse but rarely stay for long. The items to be sent to distributors in export markets are sent to another warehouse, leaving GSI to deal with the distribution in Britain and those countries which have no agents.

Many items go almost immediately to the growing number of retailers now stocking the Spectrum and the ZX-81, while the rest go in batches of 50 to the mail order customers.

When the mail order system is running smoothly there is a clear number of stages in the processing of each order. Every morning the post is sorted into the queries and the orders, which are then further divided, depending on the goods required and the method of payment.

Cheques and cash are paid into a special holding account, where the money stays until the order has been satisfied; then it is transferred to the Sinclair sales account. Credit cards are not charged until the order has been fulfilled.

The orders are then entered on the computer and all the data stored on tape. When the goods are available to be sent, address labels are printed and another Spectrum or box of cassettes is ready for the post.

At the moment it is possible for GSI to say which stage a particular order has reached but not where it is within that stage. That resulted in many complaints during the Spectrum delay difficulties last year. Although an anxious customer could be told that their order had been received but was not about to be despatched, they could not find the place of their order in the queue. A new system is being installed which will allow the state of orders to be seen at a glance.

Brown adds that at the height of the problems it was difficult to be more specific, so that customers were not misled.

"We could give only general replies as the situation was always changing, so we thought it better not to give a specific answer which might then have to be altered," he says.

"Sinclair made a policy that everyone should be kept as informed about the position as possible and I think we were able to achieve that."

Most of the queries and complaints were by telephone, a customer service which has grown rapidly along with the rest of the Sinclair business. In October, 1980 there were only two lines. They have grown in stages, first to four, then eight, then 18, and last summer another 10 were added.

"In the early days on our two lines we were receiving about 100 calls a day. When the ZX-81 was launched that exploded to 1,000 a day. Now I think we probably have a capacity of about 2,000 a day," Brown says.

The calls deal with a vast number of subjects. Apart from complaints about non-delivery or faulty machines, many users need advice on particular aspects of using the machines. Some things, such as saving and loading difficulties, are the subjects of regular queries and there are almost 40 leaflets giving advice which can be sent.

For the more complicated queries there are three more technically-minded people available who attempt to find an answer.

Whatever the difficulty most of the callers are still polite. Even when the delays were at their worst last year, no-one became abusive when making complaints.

The GSI position as the public face of Sinclair Research will be reduced as the retail sales of Sinclair products increases. It is likely to remain the first place people will contact with their problems and complaints and will remain an important part of a string of companies involved in the production and selling of Britain's most popular computers.

The warehouse filled with Sinclair products ready for despatch

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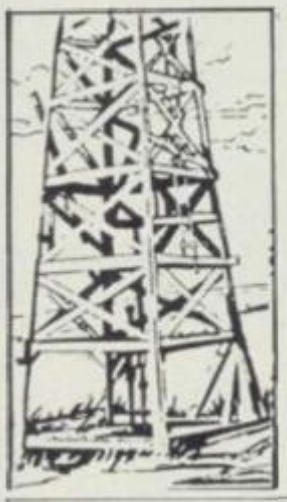

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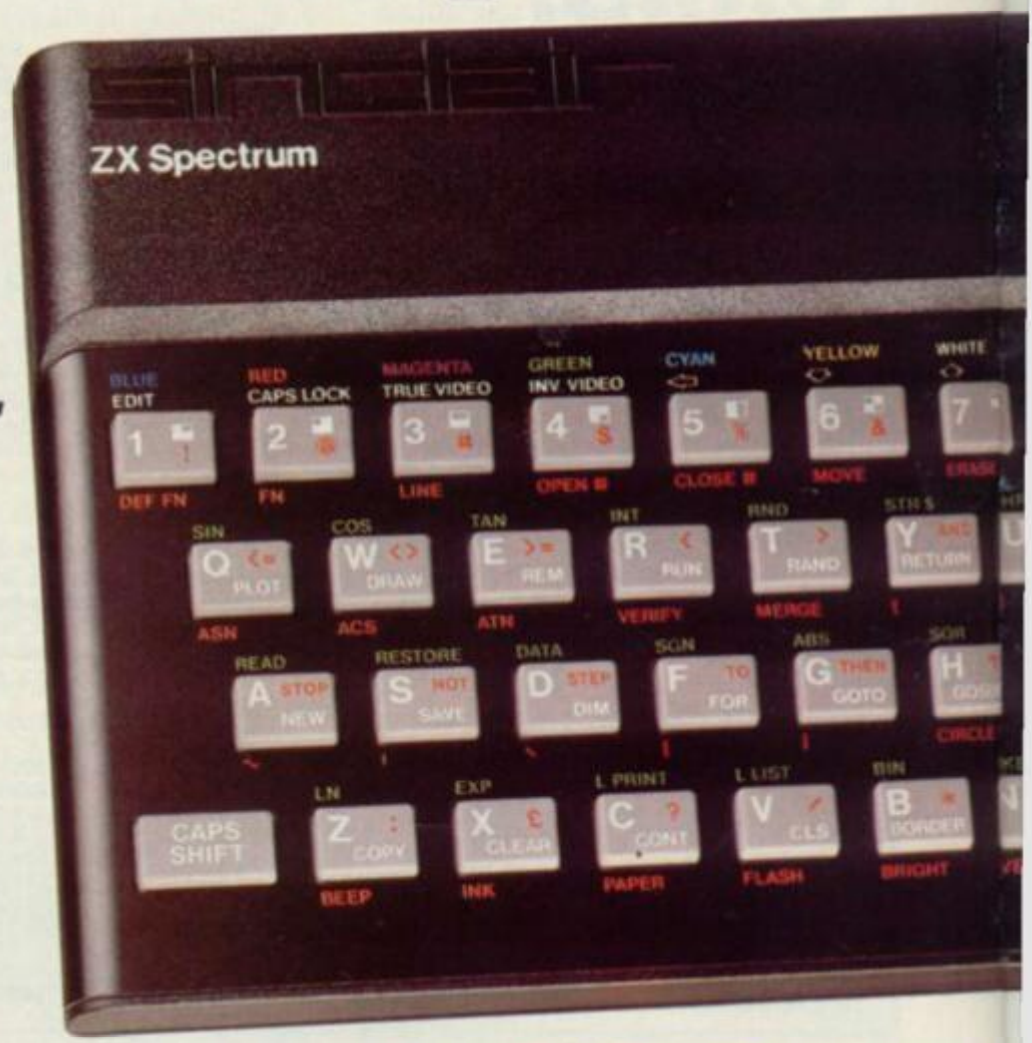

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Key features of the Sinclair ZX Spectrum

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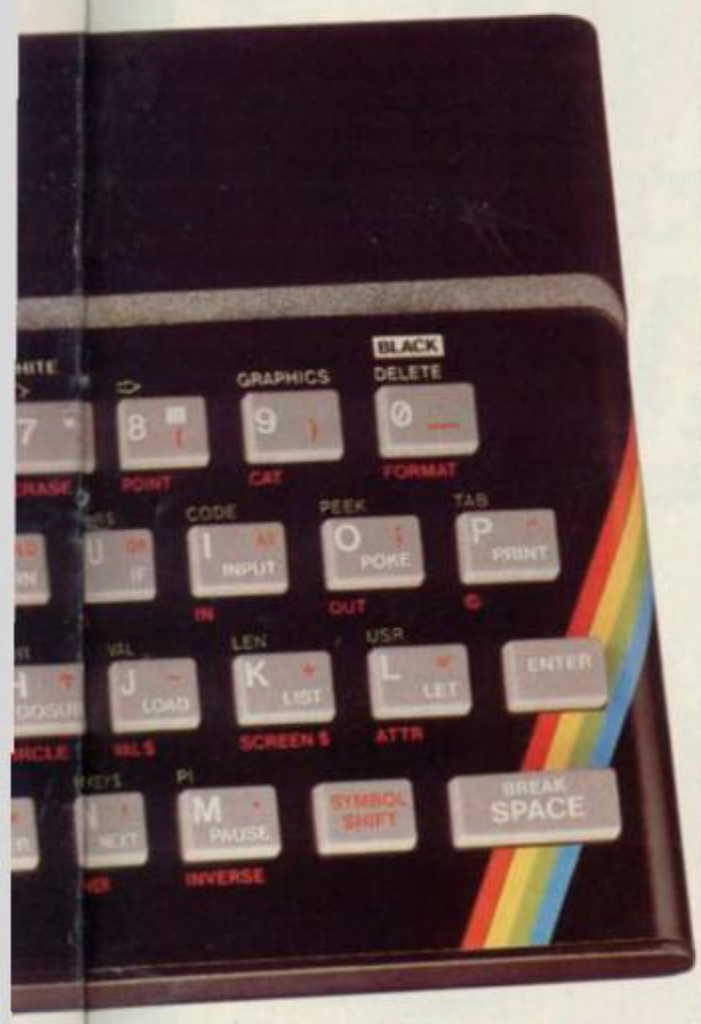

The ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

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How to order your ZX Spectrum

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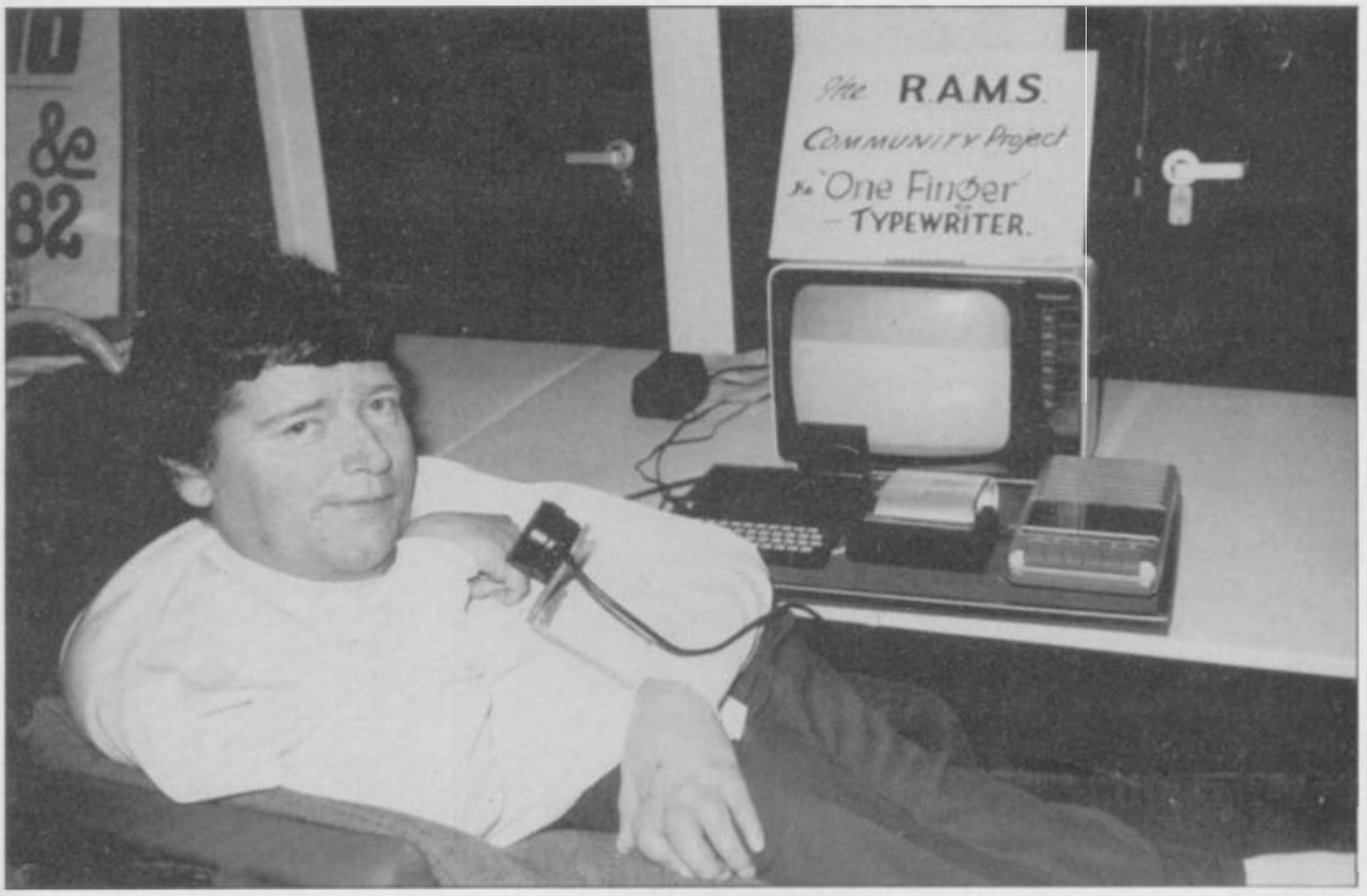

A competition to see how micros could help the disabled resulted in an idea which was developed into the one-fingered typewriter

Club helps handicapped take advantage of ZX-81

AT A TIME when a competition was being run on the application of microcomputers to the problems of disability, a suggestion was made at Ashley House, a Shaftesbury Society home for the care of severely handicapped men at Bognor Regis, that a little black box used for chess could be doing something useful. How about making it work as an intelligent interface between someone's disability and something a person really wanted to do?

It seemed a good idea and was identified as an area which looked promising. A resident of 25 years, balanced and intelligent but permanently confined to a bed or a chair since the age of three, has a disability which means he can just about move one finger over a four-position microswitch touchplate by which he controls his electrically-propelled bedchair. The problem was that he wanted desperately to be able to write his own letters, and perhaps even his life story. So began the quest for the one-fingered typewriter.

There was sufficient respect for the ZX-81 to believe it was capable of doing the job but attempting to develop a program for it seemed difficult. After two attempts to obtain help the project was shelved for a time. Then at the Regis Amateur Micro Society when ideas were requested for a club community project it seemed like something those earnest enthusiasts could do.

Many club members contributed ideas and suggestions and Paul Chase, a bright young Bognorian, leapt at the chance and began to produce programs of ever-increasing application and sophistication. He had seen that if the problem could be solved it was applicable to any disabled person who could move a finger or a toe or an elbow or a head sufficiently to operate a four-position sensor that they would be able to type. It was a fascinating and exciting idea and the cost of the equipment was falling by the month.

He produced not only a one-fingered typewriter program but carried through to add a current-line edit faciity which resulted in virtually a one-fingered word processor.

The description of the one-fingered typewriter will necessarily be brief and incomplete, since new ideas are being conceived fast. Also there are many improvements which can be made when time and money are available.

The Mark 1 equipment consists conventionally of a TV set used as a monitor, a ZX-81 with 16K RAM, a Sinclair printer and a tape recorder. Additionally

continued on page 60

continued from page 59

there are five wires soldered inside the ZX-81 to provide the four control signals required. Those wires are connected via a plug and lead to a four-position micro-switch touchplate closely matching the device already used for chair control, but other control devices could be fitted for others with different disabilities.

The clever portion goes into the program. On loading, the first few lines appear automatically at the top of the screen as the text control system. It looks like this:

To explain, there is a central cursor in line three which can be moved left and right and up and down according to the four signals available from the touchplate. Line two contains the alphabet sorted into order of the most-used letter frequency, split left and right, and centred on an inverse for the space function between words.

That alphabetical arrangement appears a little strange at first sight but is remarkably economic in cursor movement and permits a rapid location of the required letters with a little practice.

Pushing the controller up when the cursor is under a desired letter or symbol causes the automatic transfer of that letter to its proper position next in the line of text, typewriter style, and pushing it up and holding it for a short time — adjustable — results also in the transfer of the additional letter, if any, from line one, which carries the second letter of the most-frequently-used letter combinations, TH, QU, and the like.

Pushing down the controller brings the cursor to operate on the lower line of characters wherein lie the punctuation marks, single character rubout (inverse R), the numerals, and the EDIT facility. In the EDIT mode a second cursor can be moved left, right, up and down through the text area to define the point of operation.

The commands available are:

E enter edit mode.

D delete — you then enter the number of characters to be removed.

I insert letters words and spaces — insertions are first printed at the bottom of the screen for checking

T terminate — signals the end of the EDIT mode. Insertions are transferred to the defined point and any displaced text is re-arranged.

Thus by the use of only four signals not only can all the characters be chosen fairly rapidly but a degree of text modification can be achieved which would be impossible on a normal typewriter.

When the text area of the screen is full, printing follows automatically and the last two lines of text are reprinted at the top of the text area to aid continuity of thought. Printing of an only part-filled screen can be achieved by a cursor-selected COPY instruction — inverse C — and pre-programmed name and address facilities are available by selecting inverse N and inverse A respectively.

Inverse P provides automatic indentation of a line for a new paragraph. A later version of the program also includes 10 or so of the most popular small words, THE, IS, AND, selectable directly by cursor.

Obviously that is not the end of the story. Bright new ideas seem to arise at an average of one every 30 seconds and the difficulty will be reaching the stage of final definition, when there is still a good deal more which could be done. The best of all, though, is that there is a one-fingered typewriter which works.

Upper- and lower-case letters would be a great improvement and the Sinclair printer, remarkable though it is, is not really the instrument on which to frame important personal thoughts. Equally, the loading of a program from tape is something a disabled person could well do without, since it involves having to ask somebody else to do the loading.

Also a file of standard letters would be a useful facility. All those problems are easily soluble, at a price, but the remarkable thing about the project is how far it has moved on interest, goodwill and no budget; and its low-cost, value-for-money aspect is an important part of its virtues.

> 'There was sufficient respect for the ZX-81 to believe it was capable of doing the job but trying to develop a program seemed difficult'

The Mark II one-fingered typewriter looks as if it should be based on a Spectrum for upper- and lower-case letters, the possibility of Microdrive loading, and potential connection to a more sophisticated printer. If possible, the program could be put into ROM instead of RAM and the loading chore eliminated entirely.

It would be impossible to acknowledge everybody who contributed to the synthesis of ideas which were worked into an operating program but without a club of enthusiasts it probably would not have happened.

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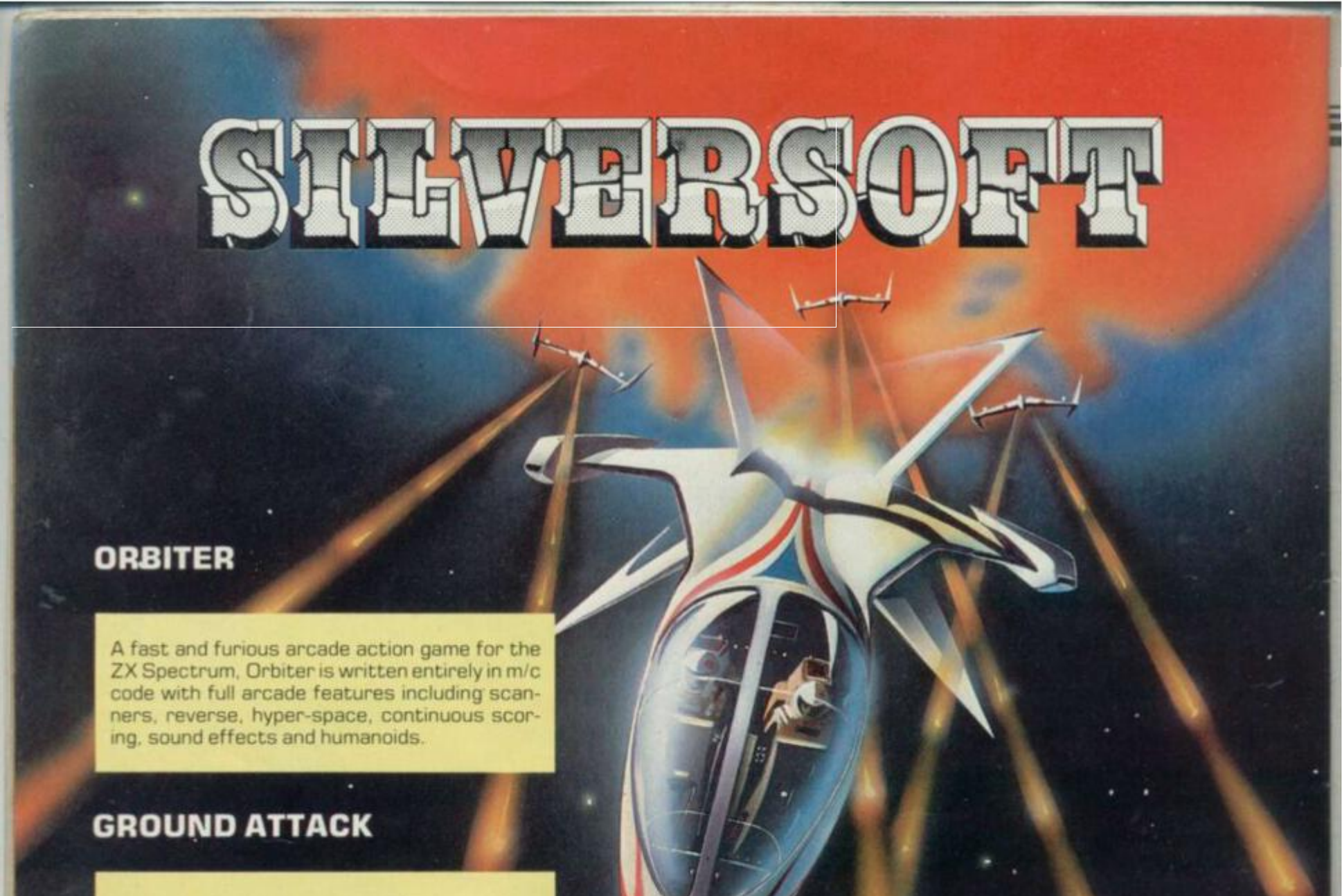

ORBITER

A fast and furious arcade action game for the ZX Spectrum. Orbiter is written entirely in m/c code with full arcade features including scanners, reverse, hyper-space, continuous scoring, sound effects and humanoids.

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Survival is the name of the game in this exciting scramble-type arcade game. Fast machine code action with full arcade features.

NEW

MUNCHER

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NEW

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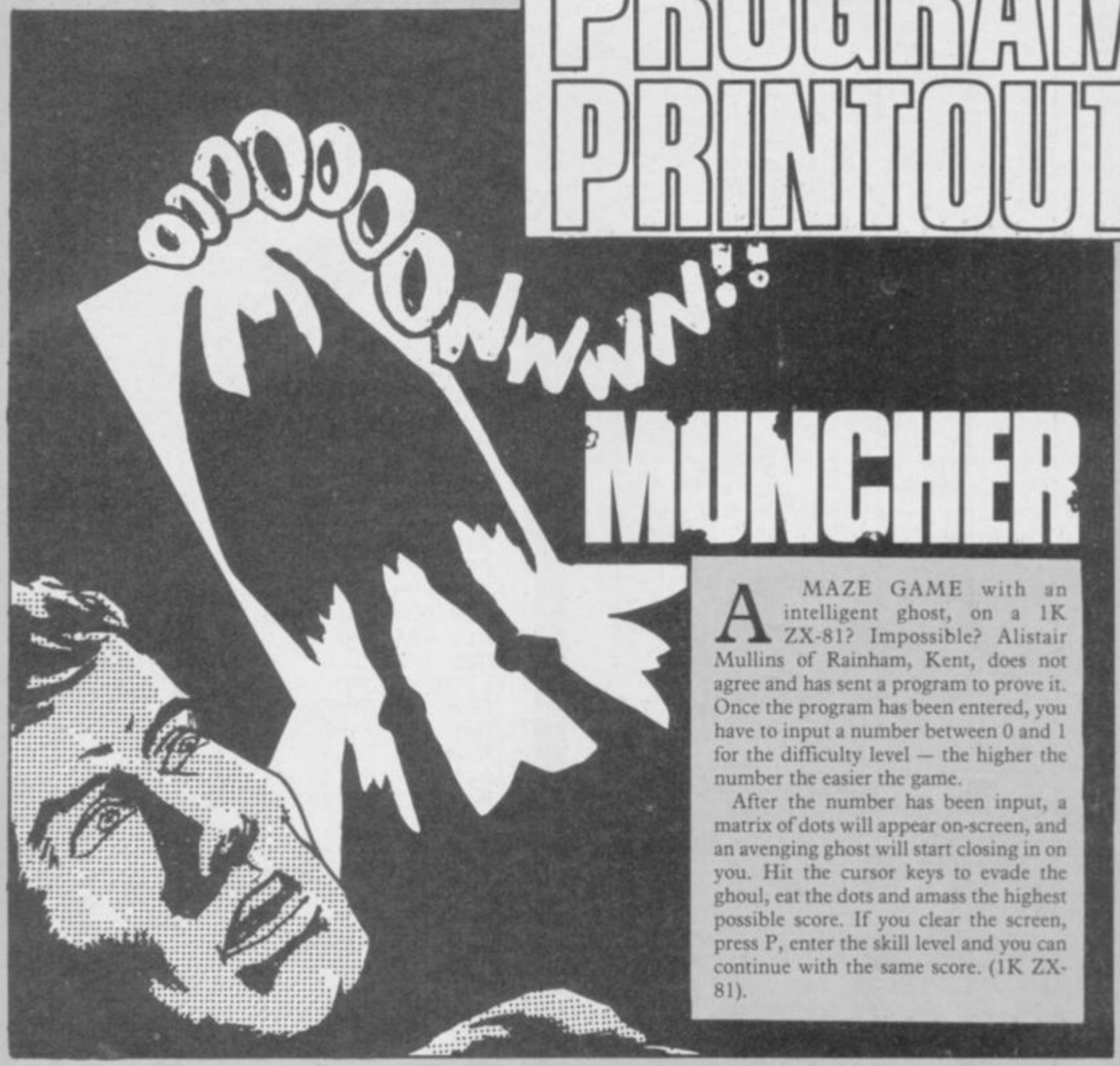


MUNCHER

A MAZE GAME with an intelligent ghost, on a 1K ZX-81? Impossible? Alistair Mullins of Rainham, Kent, does not agree and has sent a program to prove it. Once the program has been entered, you have to input a number between 0 and 1 for the difficulty level — the higher the number the easier the game.

After the number has been input, a matrix of dots will appear on-screen, and an avenging ghost will start closing in on you. Hit the cursor keys to evade the ghoul, eat the dots and amass the highest possible score. If you clear the screen, press P, enter the skill level and you can continue with the same score. (1K ZX-81).

```
  10 LET S=0
  14 CLS
  15 INPUT A
  20 LET Q=1
  30 LET W=1
  40 LET R=INT (RND*7)+1
  50 LET E=INT (RND*7)+1
  60 FOR F=1 TO 10
 110 PRINT "(ten inverse full st
ops)"
 120 NEXT F
 130 IF INKEY$="P" THEN GOTO 14
 190 PRINT AT Q,W;"(inverse <)"
 200 IF PEEK (PEEK 16398+256*PEE
K 16399)=155 THEN GOSUB 1000
 300 LET Q=Q+(INKEY$="6" AND Q<8
)-(INKEY$="7" AND Q>1)
 310 LET W=W+(INKEY$="8" AND W<8
)-(INKEY$="5" AND W>1)
 314 IF Q=R AND W=E THEN GOTO 70
00
 315 IF RND<A THEN GOTO 130
 320 PRINT AT R,E;CHR$ 11
 322 IF PEEK (PEEK 16398+256*PEE
K 16399)-128 OR 155 THEN PRINT A
T R,E;"(inverse SPACE)"
 330 LET R=R+(Q>R)-(Q<R)
 340 LET E=E+(W>E)-(W<E)
 900 GOTO 130
1100 LET S=S+1
1150 PRINT AT Q,W;"(inverse SPAC
E)"
1200 RETURN
7000 PRINT S
```

```
    2 GOSUB 8000
    4 CLS
    5 FAST
    6 DIM B$(12,12)
    7 GOSUB 1800
    8 LET BB=0
    9 LET R=0
   12 FOR L=38 TO 64
   20 LET J$="(graphic H;IS;graph
ic H;IS;graphic H;IS;graphic H;I
S)"
   21 LET M$="(IS;graphic H;IS;gr
aphic H;IS;graphic H;IS;graphic
H)"
   22 FOR I=1 TO 8
   23 PRINT AT 2,I+2;I;
   24 NEXT I
   27 FOR T=1 TO 4
   30 PRINT AT 1+(2*T),3;J$
   31 PRINT AT 2+(2*T),3;M$
   32 NEXT T
   33 LET A=37
   40 FOR I=1 TO 8
   50 LET A=A+1
   60 PRINT AT I+2,11;CHR$ A
   70 NEXT I
   75 REM **PRINT STARTING POS.**
   90 FOR I=1 TO NU
  100 PRINT AT 10,(I*2)+1;"d";
  102 LET B$(10,(I*2)+1)="d"
  110 NEXT I
  113 LET X=INT (RND*4)*2+3
  120 PRINT AT 4,X;"h"
  121 LET B$(4,X)="h"
  122 LET HX=X
  123 LET HY=4
  200 SLOW
  205 LET R$=" "
  207 REM **INPUT AND ANALYISE MO
VE"
  210 PRINT AT 17,0;"INPUT MOVE"
  220 INPUT A$
  230 IF LEN A$>=3 OR LEN A$<=1 T
HEN GOTO 310
  240 INPUT Q$
  250 IF LEN Q$>=3 OR LEN Q$<=1 T
HEN GOTO 310
  256 LET P=CODE A$(1 TO 1)-35
  257 LET I=CODE A$(2 TO 2)-26
  258 LET W=CODE Q$(1 TO 1)-35
  259 LET E=CODE Q$(2 TO 2)-26
  260 IF P<>W+1 OR I<>E+1 AND I<>
E-1 THEN GOTO 310
  265 IF W<3 OR W>10 OR E<3 OR E>
10 THEN GOTO 310
  266 REM **PRINTING MOVE**
  267 IF B$(P,I)<>"d" THEN GOTO 3
10
  280 PRINT AT W,E;"d"
  285 LET B$(W,E)="d"
  293 IF I>10 OR P>10 THEN GOTO 3
10
  295 PRINT AT P,I;"(IS)"
  297 LET B$(P,I)="(IS)"
  298 LET BB=BB+1
  299 GOSUB 2400
  300 IF R$<>" " THEN GOTO 4000
  305 GOTO 200
  309 REM **INCORRECT MOVE**
  310 PRINT AT 0,15;"INCORRECT MO
```

HARE

```
VE"
  315 PAUSE 90
  316 PRINT AT 0,15;"
   "
  320 GOTO 200
  790 GOTO 1800
 1799 REM **SETTING UP MATRIX**
 1805 FOR I=1 TO 11 STEP 2
 1810 FOR J=1 TO 11 STEP 2
 1815 IF I=1 OR I=11 OR J=1 OR J=
11 THEN GOTO 1830
 1820 LET G$="(IS)"
 1825 GOTO 1835
 1830 LET G$="e"
 1835 LET B$(I,J+1)=G$
 1840 LET B$(I+1,J)=G$
 1845 NEXT J
 1850 NEXT I
 1855 RETURN
 2409 REM **SOME STRATEGY**
 2418 FAST
 2420 GOSUB 5000
 2450 SLOW
 2526 IF REC=0 THEN RETURN
 2543 REM **PRINT COMPUTERS MOVE*
 2544 LET B$(HY,HX)="(IS)"
 2545 PRINT AT HY,HX;"(IS)"
 2550 LET HY=NHY
 2551 LET HX=NHX
 2555 LET B$(HY,HX)="h"
 2556 PRINT AT HY,HX;"h"
 2591 RETURN
 3999 REM **FINISH OFF GAME**
 4000 PRINT AT 16,0;"YOU HAD ";BB
;" GOES"
 4001 PRINT AT 17,0;R$;".ANOTHER
GAME?"
 4010 INPUT I$
 4015 IF I$="Y" OR I$="YES" THEN
RUN
 4020 PRINT AT 21,0;"THANKS FOR T
HE SESSION"
 4030 STOP
 5040 REM **GET TOTAL X COORDS OF
 DOGS**
 5045 LET C=0
 5050 FOR I=3 TO 10
```

JAMES and Richard Beatty of Old Windsor, Berkshire, have sent an excellent listing of a game new to us, called **Hare and Hounds**. Your ZX-81 plays the hare and you and your four hounds have the task of trying to block its progress to the bottom of the chess-style playing board.

The computer-controlled hare can move in any direction; your hounds can go only forwards and the whole menagerie must stick to the black squares. The computer shows surprising cunning, even having the ability to claim victory or concede defeat before the game has been played-out completely. It also boasts of being unbeatable if you restrict yourself to three hounds; in our experience that may be correct.

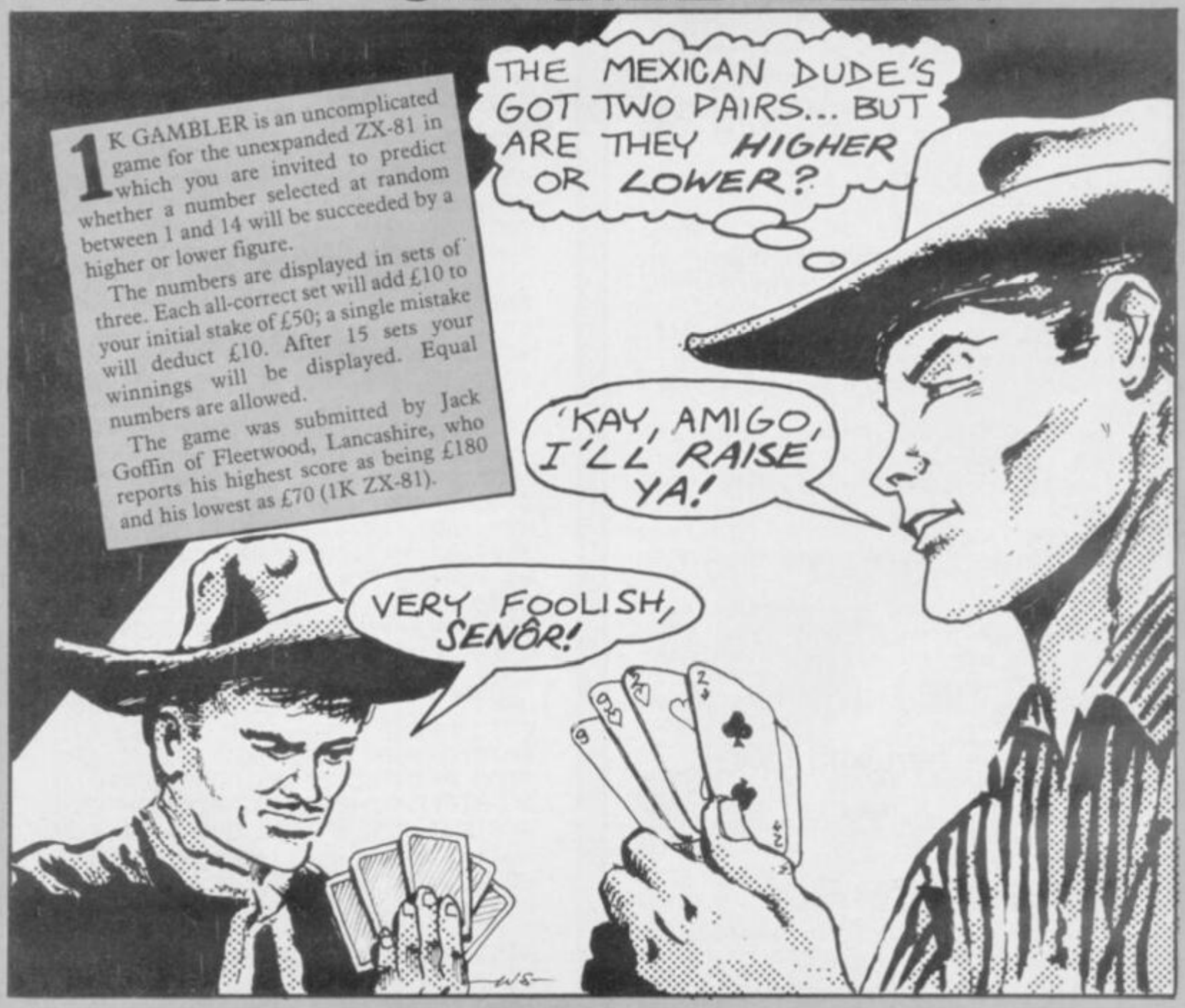
Enter your hound's present position as "Letter, Number, NEWLINE", and then its projected position one square on, in the same fashion; the computer will check for invalid moves. (16K ZX-81).

```
5060 FOR J=3 TO 10
5070 IF B$(I,J)="d" THEN LET C=C
+J
5080 NEXT J
5085 NEXT I
5450 REM **CHOOSE PREFERED X COO
RD OF DESTINATION TO OUTFLANK DO
GS**
5480 LET PC=-1
5481 LET PD=1
5485 IF C/NU>6.5 THEN GOTO 5500
5487 IF C/NU=6.5 AND RND>.5 THEN
 GOTO 5500
5490 LET PC=1
5491 LET PD=-1
6100 LET REC=0
6102 REM **CHECK FOR TACTICAL TH
RUST IN NON PREFERED DIRECTION**
6105 GOSUB 6300
6110 IF REC=1 THEN GOTO 6200
6115 REM **1-MOVE LOOK-AHEAD.(1)
ADVANCE.(2)PREFERED DIRECTION**
6120 FOR K=1 TO 2
6130 FOR I=HY+1 TO HY-1 STEP -2
6135 LET NHY=I
6140 FOR J=HX+PC TO HX+PD STEP (
2*PD)
6145 LET NHX=J
6150 IF B$(I,J)<>"(IS)" THEN GOT
O 6170
6155 IF K=1 THEN GOSUB 6500
6160 IF WF=1 THEN GOTO 6170
6163 LET REC=1
6165 GOTO 6200
6170 NEXT J
6175 NEXT I
6180 IF K=2 THEN GOTO 6200
6185 NEXT K
6205 IF REC<>1 THEN LET R$="I RE
SIGN,YOU WIN."
6219 LET K=0
6220 FOR I=(NHY+1) TO 10
6223 LET K=K+1
6225 FOR J=(NHX-K) TO (NHX+K) ST
EP 2
6230 IF J<3 OR J>10 THEN GOTO 62
60
6235 IF B$(I,J)="d" THEN RETURN
6260 NEXT J
6265 IF I=10 THEN GOTO 6280
6270 NEXT I
6280 LET R$="I CLAIM A WIN"
6281 RETURN
6300 REM **FORWARD THRUST?**
6305 IF B$(HY+1,HX+PD)="(IS)" AN
D B$(HY+2,HX+(2*PD))="(IS)" AND
(B$(HY+1,HX+PC)<>"(IS)" OR B$(HY
+2,HX+(2*PC))<>"(IS)") THEN GOTO
 6350
6345 RETURN
6350 LET NHY=HY+1
6355 LET NHX=HX+PD
6360 LET REC=1
6365 RETURN
6500 REM **DANGER?**
6510 LET WF=0
6515 REM **BOXED IN**
6520 IF B$(I+1,J+1)="(IS)" OR B$
(I+1,J-1)="(IS)" OR B$(I-1,J+1)=
"(IS)" OR B$(I-1,J-1)="(IS)" THE
N RETURN
6540 REM **AND A DOG WILL KILL**
6550 IF B$(HY+1,HX+1)="d" OR B$(
HY+1,HX-1)="d" THEN LET WF=1
6570 IF K=1 AND I>HY THEN LET WF
=1
6575 RETURN
8009 REM **HOW MANY DOGS?**
8010 CLS
8011 PRINT "DO YOU WANT 3 OR 4 D
OGS"
8012 PRINT
8013 PRINT
8020 PRINT "(IT IS CONSIDERED IM
POSSIBLE TO BEAT ME WITH THREE D
OGS,BUT SEE IF YOU CAN FIND A SO
LUTION"
8030 INPUT NU
8040 IF NU=3 OR NU=4 THEN RETURN

8050 PRINT "INPUT A VALID ANSWER
."
8060 GOTO 8030
```

```
  1 LET F=50
 10 FOR S=1 TO 15
 15 CLS
 20 PRINT AT 1,1;"£";F,S
 30 LET A=INT (RND*14)+1
 40 PRINT AT 10,10;A
 50 LET C=INT (RND*14)+1
 60 INPUT B$
 70 IF B$="L" THEN PRINT AT 10,
13;C
 80 IF B$="H" THEN PRINT AT 10,
13;C
 90 IF B$="L" AND C>A THEN GOTO
 230
 100 IF B$="H" AND C<A THEN GOTO
 230
 110 LET D=INT (RND*14)+1
 120 INPUT C$
 130 IF C$="L" THEN PRINT AT 10,
16;D
 140 IF C$="H" THEN PRINT AT 10,
16;D
 150 IF C$="L" AND D>C THEN GOTO
 230
 160 IF C$="H" AND D<C THEN GOTO
 230
 170 LET F=F+10
 175 PRINT "WIN"
 180 PAUSE 100
 200 NEXT S
 210 GOTO 270
 230 LET F=F-10
 235 PRINT "LOSE"
 240 PAUSE 50
 260 NEXT S
 270 CLS
 290 PRINT " YOUR FINISH=£";F
 300 IF F<50 THEN PRINT "YOU HAV
E LOST £";50-F
 310 IF F>=50 THEN PRINT "YOU HA
VE WON £";F-50
```

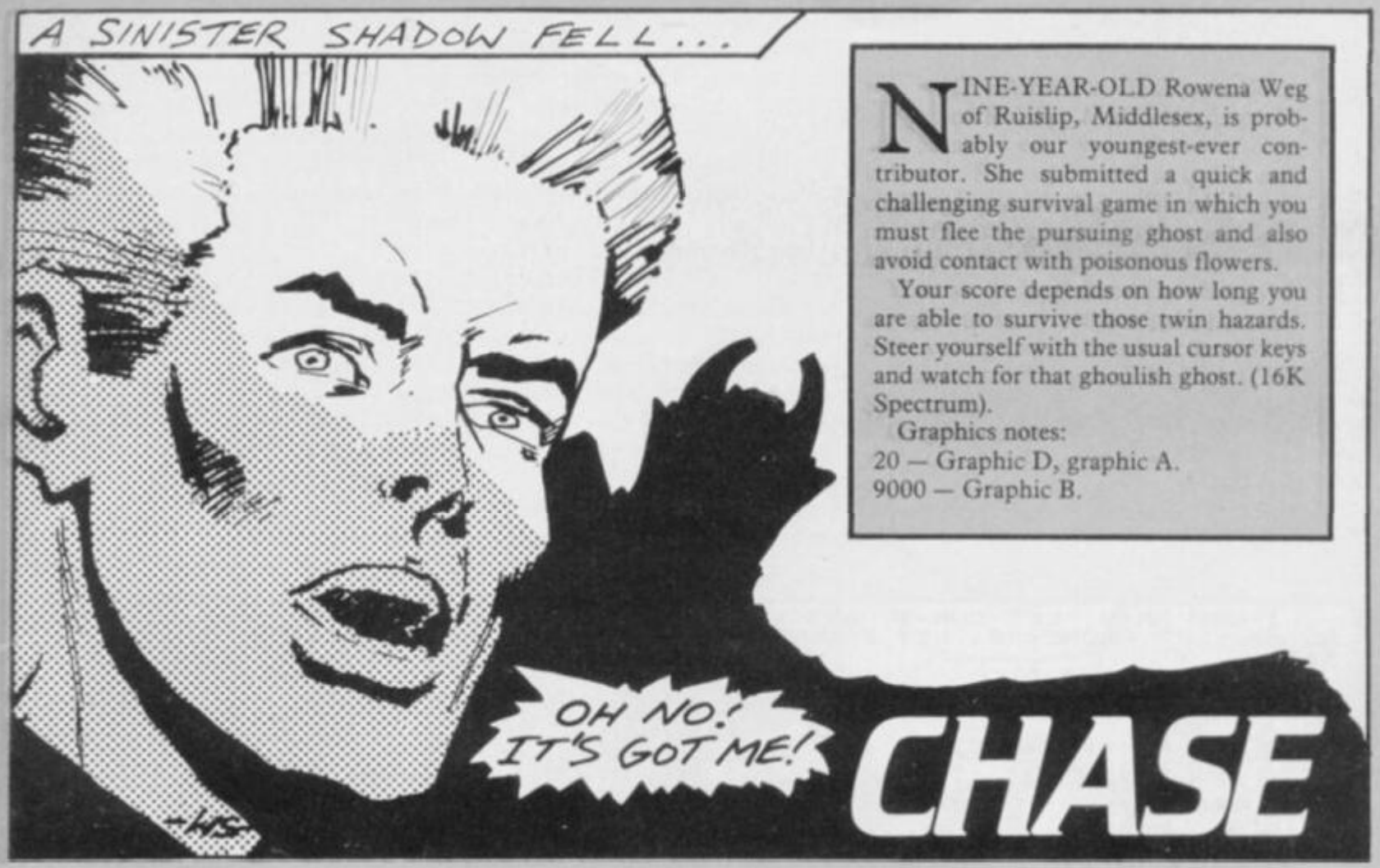
1K GAMBLER



1K GAMBLER is an uncomplicated game for the unexpanded ZX-81 in which you are invited to predict whether a number selected at random between 1 and 14 will be succeeded by a higher or lower figure.

The numbers are displayed in sets of three. Each all-correct set will add £10 to your initial stake of £50; a single mistake will deduct £10. After 15 sets your winnings will be displayed. Equal numbers are allowed.

The game was submitted by Jack Goffin of Fleetwood, Lancashire, who reports his highest score as being £180 and his lowest as £70 (1K ZX-81).



NINE-YEAR-OLD Rowena Weg of Ruislip, Middlesex, is probably our youngest-ever contributor. She submitted a quick and challenging survival game in which you must flee the pursuing ghost and also avoid contact with poisonous flowers.

Your score depends on how long you are able to survive those twin hazards. Steer yourself with the usual cursor keys and watch for that ghoulish ghost. (16K Spectrum).

Graphics notes:
20 — Graphic D, graphic A.
9000 — Graphic B.

```
  1 GO SUB 9900: GO SUB 6000: L
ET t=0: LET hi=0
  2 CLS : PRINT AT 10,10; INVER
SE 1;"THE CHASE";AT 15,4; INVERS
E 0;"by  Rowena Weg (Age 9)"
  5 PAUSE 1000: CLS : PRINT AT
3,10; INVERSE 1;"THE CHASE": PRI
NT AT 5,0;"Do you want to accele
rate using SYMBOL SHIFT or do yo
u want to  be in full speed the
whole time.It is suggested that
at first  symbol shift should b
e used to  get familiar with the
 speed  at which you are trav
elling."
  6 INPUT "Type y for you to ha
ve full  speed the whole time
";s$: CLS : PRINT AT 3,10; INVER
SE 1;"THE CHASE": PRINT AT 5,0;"
Type 1 for full speed";AT 6,5;"2
 for medium speed";AT 7,5;"3 for
 slow speed": INPUT "speed?";s:
CLS
  7 IF s=1 THEN LET s1=.003
  8 IF s=2 THEN LET s1=0.01
  9 IF s=3 THEN LET s1=0.09
 10 LET x=2: LET y=2: LET e=20:
 LET n=27
 11 PRINT AT 0,0; INVERSE 1;"SC
ORE:";t;AT 0,15;"HI-SCORE:";hi:
RESTORE : GO SUB 9000
 20 PRINT AT e,n; INK 4; INK 0;
 FLASH 1; BRIGHT 1;"■";AT y,x; I
NK 5; INVERSE 0; FLASH 0; BRIGHT
 0;"#": BEEP s1,0
 25 PRINT AT e,n; INK 6;" ";AT
y,x; INK 5;" "
 30 LET tim=0: LET x1=0-(IN 614
38<>255-4)+(IN 63486<>255-16): L
ET y1=0+(IN 61438<>255-8)-(IN 61
438<>255-16): LET x1=x1+(INKEY$=
"(" OR (s$="y" AND x1=1))-(INKEY
$="%" OR (s$="y" AND x1=-1)): LE
T y1=y1+(INKEY$="&" OR (s$="y" A
ND y1=1))-(INKEY$="'" OR (s$="y"
 AND y1=-1)): LET e1=0-(y<e)+(y>
e): LET n1=0+(x>n)-(x<n)
 31 LET tim=tim+1: IF tim>3 THE
N LET e1=0: LET n1=0: LET tim=0:
 GO TO 33
 32 IF ATTR (e+e1,n+n1)=57 OR A
TTR (e+e1,n+n1)=59 OR ATTR (e+e1
,n+n1)=62 THEN LET e1=0+(RND>.5)
-(RND<.5): LET n1=0+(RND>.5)-(RN
D<.5): GO TO 31
 33 IF ATTR (y+y1,x+x1)=59 OR A
TTR (y+y1,x+x1)=57 THEN GO TO 80
00
 34 IF e=y AND n=x THEN GO TO 8
000
 35 LET x=x+x1: LET y=y+y1: LET
 e=e+e1: LET n=n+n1
 37 PRINT AT 0,6; INVERSE 1;t:
LET t=t+1
 40 GO TO 20
6000 CLS : PRINT AT 3,8; FLASH 1
;"Instructions"
6010 PRINT AT 8,5;"5 moves you l
eft"
6020 PRINT AT 9,5;"8 moves you r
ight"
6030 PRINT AT 10,5;"7 moves you
up"
6040 PRINT AT 11,5;"6 moves you
down"
6050 PRINT AT 21,0; INK 3;"Press
 any key to continue"
6060 IF INKEY$="" THEN GO TO 606
0
6070 RETURN
8000 REM player has lost
8005 PRINT OVER 1;AT e+e1,n+n1;
INK 4;"■"; OVER 1;AT y+y1,x+x1;
INK 5;"#": BEEP .03,0: BEEP .03,
-1: BEEP .03,-2: BEEP .03,-3: BE
EP .03,-2
8010 PRINT AT 10,7; BRIGHT 1;"Yo
u have  lost": INPUT "press ente
r to start again";z$
8011 IF hi<t THEN LET hi=t
8015 CLS : LET t=0: GO TO 2
9000 FOR a=1 TO 40: LET px=INT (
RND*29)+2: LET py=INT (RND*19)+2
: PRINT AT py,px; INK 3; INVERSE
 1;"#": NEXT a
9010 FOR a=1 TO 30: PRINT AT 1,a
; INK 1;"■": PRINT AT 21,a; INK
1;"■": NEXT a
9011 FOR a=1 TO 21: PRINT AT a,1
; INK 1;"■": PRINT AT a,31; INK
1;"■": NEXT a
9900 FOR c=1 TO 3: READ a$: FOR
a=0 TO 7: READ b: POKE USR a$+a,
b: NEXT a: NEXT c
9910 RETURN
9990 DATA "a",0,3,115,34,62,34,1
19,34
9991 DATA "b",165,36,255,36,36,2
55,36,165
9993 DATA "d",60,126,90,126,102,
126,126,126
9999 REM © Rowena Weg
```

ET means, of course, entirely terrestrial. This game features a peculiar, pot-bellied little creature — human, of course — and his attempts to telephone his home — to Earth, of course. To make the call, ET must find three pieces of red telephone and they, along with pieces of blue candy and a flower, are hidden in 15 holes. If ET touches a hole, he falls into it.

The controls are 1 for up, Q for down, N to go left, and M to waddle right. The A key is a special fire button which has several functions but is very costly on energy. If ET runs out of energy he will die.

To get out of a hole, you must press the fire button and then 1. The screen has two hidden zones of nine squares each. In the candy zone, signified by the appearance of the user-defined graphic J on the scoreboard, any sweets you have retrieved can be exchanged for energy by pressing fire. The flower gives instant extra energy.

If you have seven or more pieces of candy, they can be exchanged anywhere on the board. In the landing zone — u.d.g. I — you must find by trial and error the one position to enable you to call down ET's spacecraft, again with the fire button. You can call home, however, only after you have found all the pieces of the telephone.

The game suffers from being too dependent on chance; the only skill required is in remembering which holes you have already visited. The game is well-presented, even featuring some strangely familiar little tune. ET was sent by Mark Winn of Abergavenny, Gwent. (48K Spectrum).

Graphics notes:
45 — Graphic G
70 — Graphic I
75 — Graphic J
1001 — Graphic A
1060 — Graphic B, graphic A, graphic D, graphic C
3030 — Graphic E
3040 — Graphic F
3075 — Graphic E, graphic H, graphic F.

```
  1 LET PH=0: LET CAN=0: LET CA
ND=80: LET PHONE=20: LET FLOWER=
50
  5 POKE 23658,8
 10 GO SUB 1000
 15 BORDER 4: PAPER 4: INK 7: C
LS
 20 LET FL=0: LET ET=1: LET EN=
600: LET X=11: LET Y=31
 25 LET P=INT (RND*18)+2: LET O
=INT (RND*28)+2: DIM A(15): DIM
B(15)
 30 FOR F=1 TO 15
 35 LET A(F)=INT (RND*18)+4: LE
T B(F)=INT (RND*30)+1
 40 IF ATTR (A(F),B(F))<>39 THE
N GO TO 35
 45 PRINT AT A(F),B(F); INK 0;"
●": NEXT F
 46 LET Q=INT (RND*18)+2: LET W
=INT (RND*27)+2: IF ATTR (Q,W)=3
2 THEN GO TO 46
 47 FOR F=0 TO 2: PRINT AT F,0;
INK 5;"
          ": NEXT F: PRINT AT 1,1;
PAPER 5;"ENERGY"
 48 LET P=INT (RND*18)+2: LET O
=INT (RND*28)+2: IF ATTR (P,O)<>
32 THEN GO TO 48
 50 IF P=Q OR O=W THEN GO TO 48
 52 RESTORE 5000: FOR F=1 TO 7:
READ A,B: BEEP A,B: NEXT F
 55 IF ET=1 THEN PRINT AT X,Y;L
$(1);AT X-1,Y;L$(2): GO TO 70
 60 IF ET=0 THEN PRINT AT X,Y;R
$(1);AT X-1,Y;R$(2)
 65 IF INKEY$="A" THEN LET FL=1
: BEEP .2,-20: LET EN=EN-5
 70 IF (Q+1=X OR Q-1=X OR Q+2=X
OR X=Q) AND (W=Y OR W=Y+1 OR W=
Y-1) THEN PRINT AT 1,16; PAPER 5
;"⊞"
 72 IF Q=X AND W=Y AND FL=1 AND
PH>2 THEN GO TO 2000
 75 PRINT AT 1,16; PAPER 5;" ":
IF (P=X OR P+1=X OR P-1=X) AND
(Y=0 OR Y+1=0 OR Y-1=0) THEN PRI
NT AT 1,16; PAPER 5;"⊕": IF FL=1
THEN BEEP .3,-20: LET EN=EN-5:
IF CAN>0 THEN LET CAN=CAN-1: LET
EN=EN+25: PRINT AT 1,28; PAPER
5;CAN
 77 IF FL=1 AND CAN>6 THEN LET
CAN=CAN-7: LET PH=PH+1: BEEP .2,
10: PRINT AT 1,28; PAPER 5;CAN;A
T 1,22;PH
 80 LET FL=0: IF INKEY$="M" AND
Y<31 THEN LET EN=EN-1: PRINT AT
X,Y;" ";AT X-1,Y;" ": LET Y=Y+1
: LET ET=0
 85 IF INKEY$="N" AND Y>0 THEN
LET EN=EN-1: PRINT AT X,Y;" ";AT
X-1,Y;" ": LET Y=Y-1: LET ET=1
 90 IF INKEY$="Q" AND X<21 THEN
LET EN=EN-1: PRINT AT X,Y;" ";A
T X-1,Y;" ": LET X=X+1
 95 IF INKEY$="1" AND X>4 THEN
LET EN=EN-1: PRINT AT X,Y;" ";AT
X-1,Y;" ": LET X=X-1
 100 PRINT AT 1,8; PAPER 5;"
";AT 1,8; PAPER 5;INT EN: IF A
TTR (X,Y)=32 OR ATTR (X-1,Y)=32
THEN GO SUB 3000
 105 BEEP .002,EN/20: IF EN<1 TH
EN GO TO 9000
```

```
 110 IF INKEY$="A" THEN BEEP .2,
-20: LET EN=EN-5: LET FL=1
 120 GO TO 55
 999 STOP
1000 FOR F=USR "?" TO USR "@"+7
1010 READ A: POKE F,A: NEXT F
1020 DATA 62,127,127,127,14,6,6,
14,30,62,62,62,30,10,10,21
1030 DATA 124,254,254,124,112,96
,96,112,120,124,124,124,120,80,8
0,168
1040 DATA 34,85,34,36,126,60,24,
24,0,0,8,93,127,93,8,0
1050 DATA 0,16,62,126,255,126,12
4,8,0,0,246,220,200,30,28,0
1055 DATA 254,146,146,254,146,14
6,254,0,0,60,66,219,219,66,60,0
1060 DIM R$(2,1): DIM L$(2,1): L
ET L$(1)="A": LET L$(2)="B": LET
 R$(1)="C": LET R$(2)="D"
1065 DIM H(15)
1070 FOR F=1 TO 3
1080 LET D=INT (RND*15)+1: IF H(
D)<>0 THEN GO TO 1080
1090 LET H(D)=PHONE: NEXT F
1200 FOR F=1 TO 9
1210 LET G=INT (RND*15)+1: IF H(
G)<>0 THEN GO TO 1210
1220 LET H(G)=CAND: NEXT F
1230 LET R=INT (RND*15)+1: IF H(
R)<>0 THEN GO TO 1230
1235 LET H(R)=FLOWER
1240 RETURN
2000 REM LANDING
2002 IF Y<2 THEN LET Y=2
2005 IF Y>29 THEN LET Y=29
2010 CLS
2012 DIM S$(4,3)
2015 PRINT AT 16,Y; INK 7;"E";AT
 15,Y;"D"
2020 FOR F=1 TO 6: BEEP .1,30: F
OR G=1 TO 100: NEXT G: NEXT F
2030 LET S$(1)=CHR$ 132+CHR$ 140
+CHR$ 136: LET S$(2)=CHR$ 133+CH
R$ 128+CHR$ 138: LET S$(3)=S$(2)
: LET S$(4)=CHR$ 139+CHR$ 131+CH
R$ 135
2040 FOR F=4 TO 17
2045 IF INKEY$<>"" THEN GO TO 90
00
2050 BEEP .35,-30: BEEP .15,-32
2052 IF INKEY$<>"" THEN GO TO 90
00
2055 PRINT AT F-4,Y-1;"    "
2060 FOR H=0 TO 3: PRINT AT F-H,
Y-1; INK 1;S$(4-H): NEXT H: NEXT
 F
2070 PRINT AT 16,Y; INK 7;"E";AT
 15,Y;"D"
2080 BEEP 1,20
2085 PRINT AT 17,Y-1;"    "
2090 FOR F=16 TO 4 STEP -1
2100 FOR H=0 TO 3: PRINT AT F-H,
Y-1; INK 1;S$(4-H): NEXT H: PRIN
T AT F-1,Y; INK 7;"E";AT F-2,Y;"
D": BEEP .35,-30: BEEP .15,-32:
PRINT AT F,Y-1;"    ": NEXT F
2110 CLS
2120 PRINT AT 10,1;"WELL DONE YO
U HAVE SAVED ET";;" PRESS'0' TO
QUIT OR 'Y'TO START"
2125 PAUSE 50: RESTORE 5000: FOR
 F=1 TO 7: READ A,B: BEEP A,B: N
EXT F
2130 IF INKEY$="0" THEN STOP
2140 IF INKEY$="Y" THEN RUN
2150 GO TO 2130
3000 REM HOLE
3010 FOR G=1 TO 15: IF (X=A(G) O
R X-1=A(G)) AND Y=B(G) THEN GO T
O 3030
3020 NEXT G: GO TO 3060
3030 IF H(G)=FLOWER THEN LET P$=
"F": LET TOT=60: GO TO 3070
3040 IF H(G)=CAND THEN LET P$="G
": LET TOT=20: GO TO 3070
3050 IF H(G)=PHONE THEN LET P$="
H": LET TOT=30: GO TO 3070
3060 LET TOT=0: LET P$="  "
3070 PAPER 5: INK 0: BORDER 0: C
LS
3071 LET H(G)=0
3072 FOR G=0 TO 16: PRINT AT G,0
;"■";TAB 31;"■": NEXT G: FOR G=1
7 TO 21: PRINT AT G,0;"■■■■■■■■■
■■■■■■■■■■■■■■■■■■■■■■■
```

```
LS : GO SUB 4000
3242 FOR F=0 TO 2: PRINT AT F,0;
 INK 5;"                              ";: NEXT F: PRINT AT 1,1;
 PAPER 5;"ENERGY:";EN
3245 IF ATTR (X,Y)=32 THEN LET X
=X+1: GO TO 3245
3250 LET X=INT (RND*17)+5: LET Y
=INT (RND*31)+1: IF ATTR (X,Y)=3
2 THEN GO TO 3250
3255 IF M=10 AND P$="*" THEN LET
 CAN=CAN+1
3256 PRINT AT 1,28; PAPER 5;CAN
3257 IF P$="%" THEN LET PH=PH+1
3258 PRINT AT 1,22; PAPER 5;PH
3260 RETURN
3999 STOP
4000 REM HOLES
4010 FOR F=1 TO 15
4050 PRINT AT A(F),B(F); INK 0;"
*": NEXT F
4060 RETURN
5000 DATA 1,5,1.2,12,.2,10,.2,9,
.2,7,.8,9,1,5
5090 DATA 1,5,1.2,12,.2,10,.2,9,
.2,7,.8,9,1,5
5100 RETURN
9000 REM  DEAD
9010 CLS
9020 PRINT AT 2,0;" UNFORTUNATEL
Y ET HAS PERISHED       DUE TO LA
CK OF ENERGY. "
9030 IF CAN>5 THEN PRINT '" BUT
FORTUNATELY HE DIED WITH A SWEET
 TASTE IN HIS MOUTH AS YOU MANAG
ED TO RETRIEVE ";CAN;" PIECES OF
": PRINT "CANDY"
9035 RESTORE 5000: FOR F=1 TO 7:
 READ A,B: BEEP A,B: NEXT F: FOR
 F=1 TO 50: NEXT F
9040 PRINT '''"PRESS '0' TO QUIT
OR 'Y' TO START"
9045 PRINT AT 16,Y; INK 7;"▚";AT
 15,Y;"▚"
9047 PRINT AT 16,Y; INK 2;"▚";AT
 15,Y;"▚"
9050 IF INKEY$="0" THEN STOP
9060 IF INKEY$="Y" THEN RUN
9065 BEEP .1,0
9070 GO TO 9045
```

MACHINE CODE CONVERTER

ALL SINCLAIR users will be aware of the benefits of using machine code. Its increased speed is such that plodding Basic graphics are displayed with all the qualities of an animated film. So far, however, there has been no simple way of converting Basic into the speedier form.

Now a brilliant piece of programming enables the Basic programmer to convert his listing automatically into machine code by LOADing from a tape or by entering the program line by line from the keyboard.

The listing should be entered as listed — 25 zeros in the REM line — then RUN, followed by the accompanying list of numbers entered with NEWLINE in place of the commas. The numbers will be displayed on-screen for checking; when the screen is full, enter CONT for further display. When the numbers have all been input, inverted commas will appear. Enter your Basic listing line by line, or the name of your program, if using tape.

Machine Code Converter was submitted by John Sidney of 1 April Way, Coddingly, London WC IN. (16K ZX-81).

```
   5 REM 0000000000000000000000000
00
  10 FOR K=16514 TO 16538
  20 INPUT A
  21 IF A=156 THEN GOTO 30
  35 PRINT K,A
  36 IF A=125 THEN CLS
  37 IF A=125 THEN GOTO 55
  38 LET A=A+26
  40 POKE K,A
  50 NEXT K
  55 LET A$=""
  60 INPUT B$
  70 FOR K=16514 TO 16538
  80 LET A$=A$+CHR$ ((PEEK K)+10
2)
  90 NEXT K
  91 CLS
  95 FOR K=1 TO 20
 100 PRINT A$
 105 NEXT K
 106 FOR K=1 TO 19
 107 SCROLL
 108 NEXT K
 110 PAUSE 4E4
 120 RAND USR 16514

38,53,55,46,49,0,43,28,28,49,0,5
6,46,51,40,49,38,46,55,0,58,56,4
2,55,56,
```

81 Inverter

```
  3 DIM L(5)
  4 DIM L$(5)
  5 DIM I$(5)
 10 INPUT I$
 20 FOR F=1 TO 5
 25 LET S$=I$(F TO F)
 30 LET L(F)=CODE S$
 40 IF L(F)<129 THEN LET L$(F)=
CHR$ (L(F)+128)
 45 IF L(F)>128 THEN LET L$(F)=
CHR$ (L(F)-128)
 50 NEXT F
 60 PRINT AT 0,0;I$;"=";L$(1 TO
 5)
 65 STOP
```

THIS SHORT subroutine is designed to change any input five-letter word into its inverse video mode, something which is useful in many programs as a way of highlighting games results, players' names and so on.

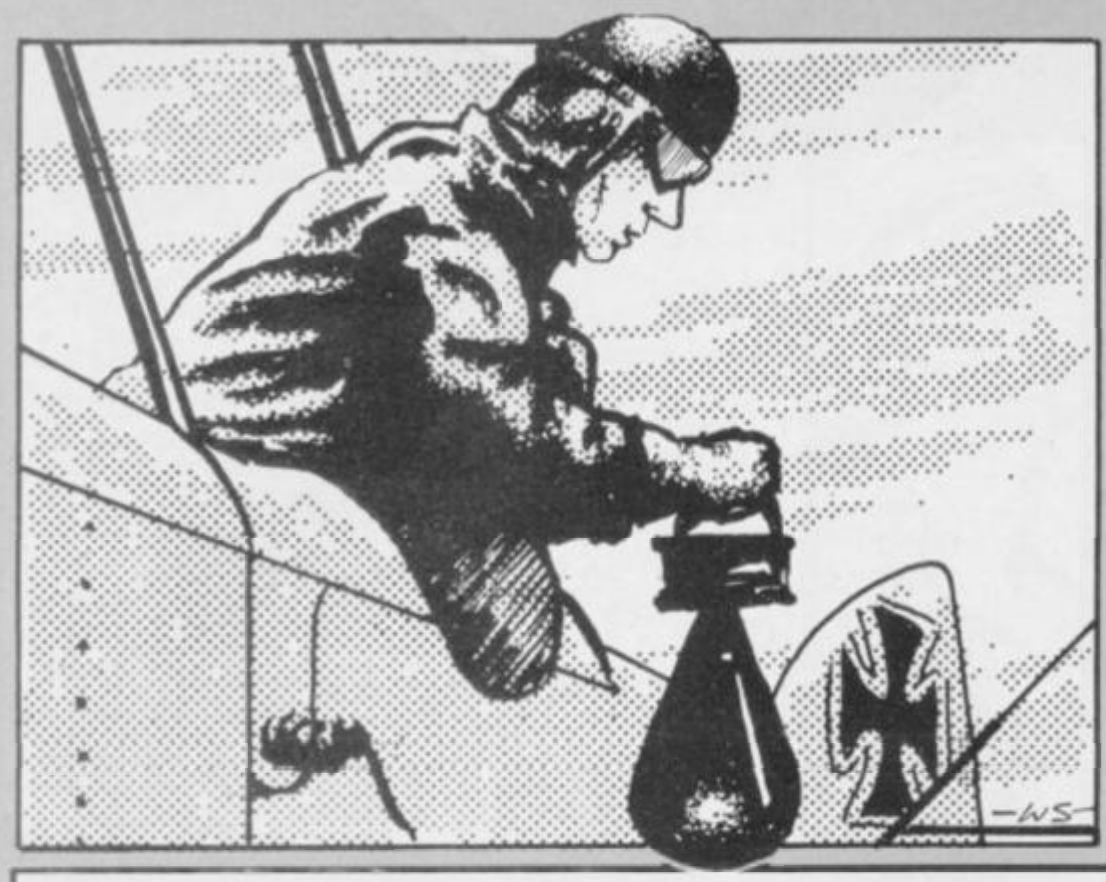
The listing was submitted by A Boucher of Mansfield, Nottinghamshire. (1K ZX-81).

FANCY BORDER

ARTHUR DOUGLAS of London E4 has sent a short machine code listing for our useful subroutines spot. His program puts a fancy border instantly round the screen, consisting of the character poked into the spare location 23681.

The second part of the program loads the user-definable variables with a few examples of interesting borders. (16K Spectrum).

```
 20 FOR J=32500 TO 32576
 30 READ A: POKE J,A: LET X=X+A
 40 NEXT J: IF X<>9060 THEN PRI
NT "ERROR IN DATA": STOP
 50 DATA 62,2,205,1,22,58,129,9
2,1,33,23,22,30,205,39,127,1,2,2
3,22,28,205,39,127,1,33,24,245
 60 DATA 205,217,13,241,22,32,2
05,56,127,1,33,3,245,205,217,13,
241,22,32,205,56,127,201,213,197
 70 DATA 245,205,217,13,241,245
,215,241,193,5,209,21,32,240,201
,213,245,215,241,209,21,32,248,2
01
 80 FOR J=USR CHR$ 144 TO USR C
HR$ 154-1
 90 READ A: POKE J,A: NEXT J
100 DATA 60,102,195,129,129,195
,102,60
110 DATA 153,51,102,204,153,51,
102,204
120 DATA 0,255,0,255,0,255,0,25
5
130 DATA 8,28,62,127,62,28,8,0
140 DATA 60,66,153,165,165,153,
66,60
150 DATA 0,73,42,28,127,28,42,7
3
160 DATA 128,193,227,247,255,19
9,131,1
170 DATA 102,195,153,60,60,153,
195,102
180 DATA 255,255,0,0,255,255,0,
0
190 DATA 255,129,189,165,165,18
9,129,255
200 FOR J=144 TO 153
210 POKE 23661,J
220 RANDOMIZE USR 32500
230 PRINT #0;AT 0,0;"Press Any
Key"
240 PAUSE 0: NEXT J
```



BOOMER

BOOMER is a catchem game during which a mad bomber rains explosives on you and, instead of running away, you must attempt to intercept them. The bomber goes lower and lower and faster and faster, Invaders-style, and you must race left and right with keys 5 and 8 before your lives are all used up.

A neat listing from Ross Henderson of Perth, Scotland, though the user-definable instructions could do with a few FOR NEXT loops. (16K Spectrum).

Graphics notes:
170 — Graphic A
180 — Graphic S
190 — Graphic D
200 — Graphic G
221 — Graphic F.

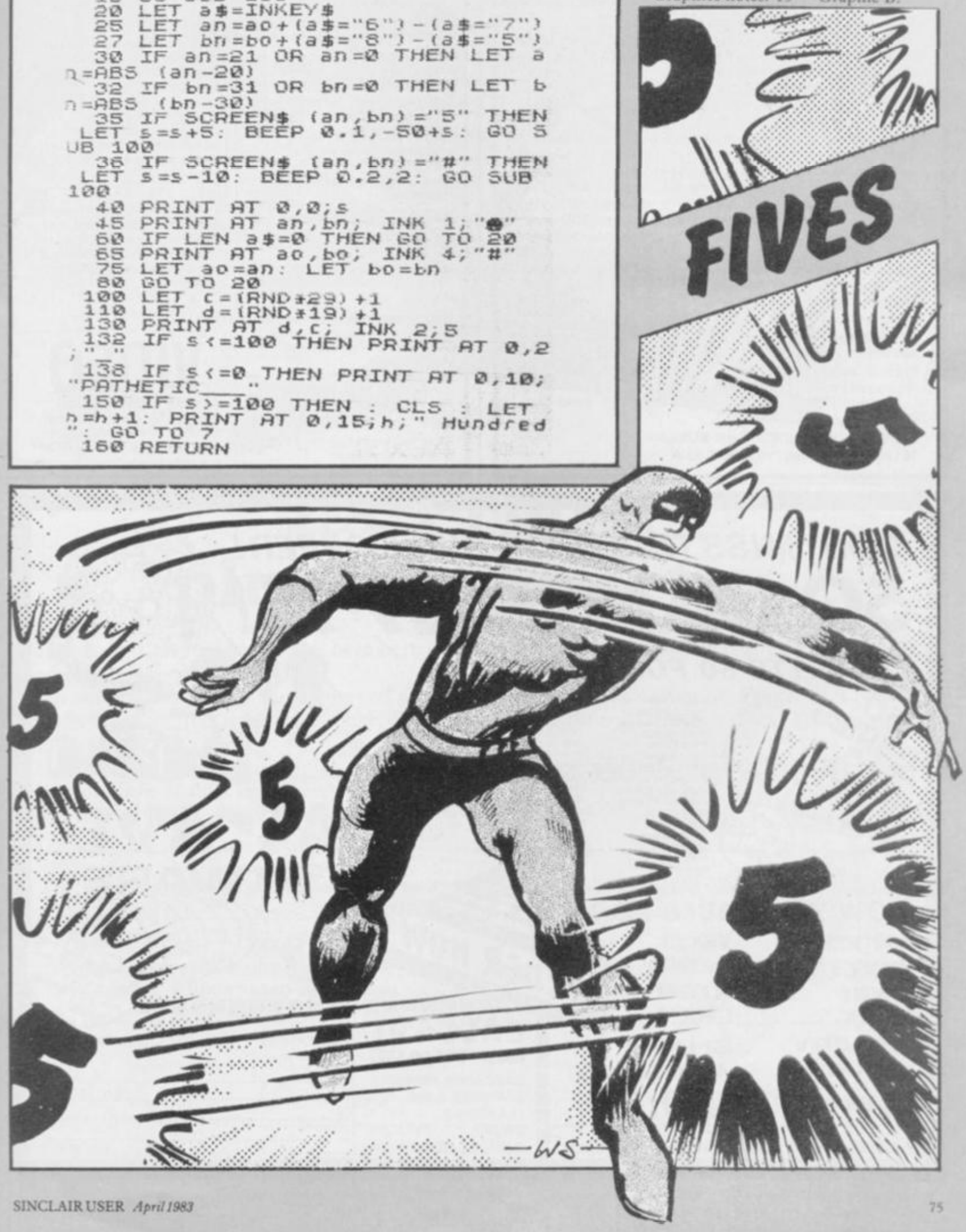
```
  0 REM © Ross Henderson
 10 REM "boomer"
 20 REM define boomer
 30 POKE USR "a",BIN 00011000
 31 POKE USR "a"+1,BIN 00100100
 32 POKE USR "a"+2,BIN 01000010
 33 POKE USR "a"+3,BIN 10100101
 34 POKE USR "a"+4,BIN 10100101
 35 POKE USR "a"+5,BIN 10000001
 36 POKE USR "a"+6,BIN 10111101
 37 POKE USR "a"+7,BIN 01000010
 40 POKE USR "s",BIN 00111100
 41 POKE USR "s"+1,BIN 00111100
 42 POKE USR "s"+2,BIN 01111110
 43 POKE USR "s"+3,BIN 11111111
 44 POKE USR "s"+4,BIN 11011011
 45 POKE USR "s"+5,BIN 11011011
 46 POKE USR "s"+6,BIN 11011011
 47 POKE USR "s"+7,BIN 00011000
 50 POKE USR "d",BIN 00011000
 51 POKE USR "d"+1,BIN 00011000
 52 POKE USR "d"+2,BIN 01111110
 53 POKE USR "d"+3,BIN 01100110
 54 POKE USR "d"+4,BIN 01100110
 55 POKE USR "d"+5,BIN 01100110
 56 POKE USR "d"+6,BIN 11100111
 57 POKE USR "d"+7,BIN 11100111
 60 REM define bomb
 61 POKE USR "f",BIN 00000000
 62 POKE USR "f"+1,BIN 00001000
 63 POKE USR "f"+2,BIN 00010000
 64 POKE USR "f"+3,BIN 00011000
 65 POKE USR "f"+4,BIN 00111100
 66 POKE USR "f"+5,BIN 01111110
 67 POKE USR "f"+6,BIN 01111110
 68 POKE USR "f"+7,BIN 00111100
 70 REM define catcher
 71 POKE USR "g",BIN 11011011
 72 POKE USR "g"+1,BIN 10111101
 73 POKE USR "g"+2,BIN 10011001
 74 POKE USR "g"+3,BIN 11111111
 75 POKE USR "g"+4,BIN 00011000
 76 POKE USR "g"+5,BIN 00111100
 77 POKE USR "g"+6,BIN 00100100
 78 POKE USR "g"+7,BIN 01100110
 80 BORDER 2: PAPER 6: INK 0: C
LS : PRINT AT 10,7;"Instructions
(y/n)": PAUSE 0: IF INKEY$="y" T
HEN GO SUB 9000
 90 REM main program
 95 LET high=0
101 BRIGHT 1: FLASH 0: INK 0: P
APER 6: BORDER 1: CLS
102 LET bombs=0: LET lives=4
103 LET y=0
110 LET cx=15: LET cy=20
120 LET lives=lives+2
135 LET p=0
140 LET by=2
150 LET bx=INT (RND*25)+1
155 IF p=0 THEN LET by=y+3
160 FOR x=1 TO 30
166 PRINT AT 21,1;"Score=";bomb
s
167 PRINT AT 21,11;"Lives=";liv
es
168 PRINT AT 21,22;"High=";high
169 IF lives<=0 THEN GO TO 9998
170 PRINT INK 0;AT y,x;" "
180 PRINT INK 2;AT y+1,x;" "
190 PRINT INK 1;AT y+2,x;" "
200 PRINT AT cy,cx-1;" "
205 IF INKEY$="5" THEN LET cx=c
x-1
206 IF INKEY$="8" THEN LET cx=c
x+1
207 IF cx>30 THEN PRINT AT 20,3
0;" ": LET cx=1
208 IF cx<1 THEN PRINT AT cy,cx
-1;" ": LET cx=30
210 IF x=bx THEN LET p=1
213 IF INT (by)<>20 THEN GO TO
216
214 IF cx=bx THEN BEEP 0.02,20:
BEEP 0.05,30: LET bombs=bombs+1
0: GO TO 215
215 IF NOT cx=bx THEN PRINT AT
by,bx; INK 2;" ": BEEP 0.5,-40:
PRINT AT by,bx;" ": LET lives=li
ves-1
216 IF by>19 THEN LET p=0: CLS
: GO TO 300
221 PRINT AT by,bx;" ": IF p=1
THEN LET by=by+1: PRINT INK 2;AT
by,bx;" ": BEEP 0.009,-by+10
230 NEXT x
232 LET by=by+1: LET y=y+1: IF
y>15 THEN GO TO 9100
240 CLS
250 GO TO 160
300 IF p=0 THEN LET by=y+2: LET
p=0: LET bx=INT (RND*30)+1
310 IF x<30 THEN NEXT x
320 GO TO 160
9000 BORDER 5: INK 0: PAPER 7: C
LS : PRINT "                B o o m
e r"
9010 PRINT """Hello my name is B
oomer !!"
9020 PRINT INK 0;"" "; INK 2;" ";" This
"
9030 PRINT INK 2;" "; INK 0;"
is"
9040 PRINT INK 1;" "; INK 0;"
ME"
9050 PRINT "''"Some people think
I'm mad but    all I do is drop b
ombs on folk""''"It just so happe
ns that I am    going to drop so
me bombs on  you""''"So get catch
ing!!"""                <-"; FLASH 1;"
5"; FLASH 0;"    "; FLASH 1;"8";
FLASH 0;"->"
9055 PAUSE 0: CLS
9060 RETURN
9100 CLS
9200 FOR n=1 TO 20 STEP 2: PAUSE
2: BEEP 0.05,n: NEXT n
9220 PAUSE 10: FOR n=1 TO 5: BEE
P 0.09,n: NEXT n
9300 GO TO 103
9998 IF bombs>high THEN LET high
=bombs
9999 FLASH 1: PAPER 2: INK 7: CL
S : PRINT AT 10,4;"Boomer has be
en now it": FOR n=0 TO -25 ST
EP -1: PAUSE 2: BEEP 0.02,n: BEE
P .01,n+5: NEXT n: PAUSE 10: FLA
SH 0: PAPER 6: INK 0: CLS : PRIN
T AT 10,10;"ANOTHER GO?": PAUSE
0: CLS : IF INKEY$="y" THEN GO T
O 100: STOP
```

```
    1 REM FIVES by WILLUM 1983
    2 REM Move using 5 6 7 8
    3 FOR t=1 TO 7: READ n
    4 POKE USR "b"+t,n: NEXT t
    5 DATA 60,126,219,255,255,231
,126,60
    6 LET h=0
    7 PLOT 248,168: DRAW -241,0:
DRAW 0,-161: DRAW 241,0: DRAW 0,
160
    8 PRINT AT 21,14;"FIVES"
   10 LET ao=8: LET bo=8: LET s=5
0: LET an=0: LET bn=0
   15 GO SUB 100
   20 LET a$=INKEY$
   25 LET an=ao+(a$="6")-(a$="7")
   27 LET bn=bo+(a$="8")-(a$="5")
   30 IF an=21 OR an=0 THEN LET a
n=ABS (an-20)
   32 IF bn=31 OR bn=0 THEN LET b
n=ABS (bn-30)
   35 IF SCREEN$ (an,bn)="5" THEN
 LET s=s+5: BEEP 0.1,-50+s: GO S
UB 100
   38 IF SCREEN$ (an,bn)="#" THEN
 LET s=s-10: BEEP 0.2,2: GO SUB
100
   40 PRINT AT 0,0;s
   45 PRINT AT an,bn; INK 1;"●"
   60 IF LEN a$=0 THEN GO TO 20
   65 PRINT AT ao,bo; INK 4;"#"
   75 LET ao=an: LET bo=bn
   80 GO TO 20
  100 LET c=(RND*29)+1
  110 LET d=(RND*19)+1
  130 PRINT AT d,c; INK 2;5
  132 IF s<=100 THEN PRINT AT 0,2
;" "
  138 IF s<=0 THEN PRINT AT 0,10;
"PATHETIC___"
  150 IF s>=100 THEN : CLS : LET
h=h+1: PRINT AT 0,15;h;" Hundred
": GO TO 7
  160 RETURN
```

FIVES, by Philip Williams of Plymouth, Devon, is a surround game with extras. Using the usual cursor keys, you steer yourself round the screen attempting to snaffle as many of the randomly-appearing figure fives as possible.

You start with 50 points. After that, you collect five for every 5 you get but your tally is cut by two 5s if you cut your tail to get to 5s. Clear? (16K Spectrum).

Graphics notes: 45 — Graphic B.



ZX81 & 16K

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"Without sounding pushy I would like to conclude this review by saying — if you have a ZX81 and like games, then you should buy Michael Orwin's cassette 4."

2 extracts from *ZX Computing*, Oct/Nov '82

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The Times, Saturday 11th December 1982
(*about Cassette 4*)

CASSETTE 1
(eleven 1k programs)
Machine code:
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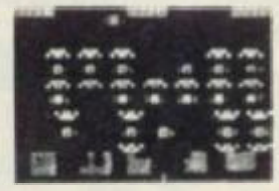
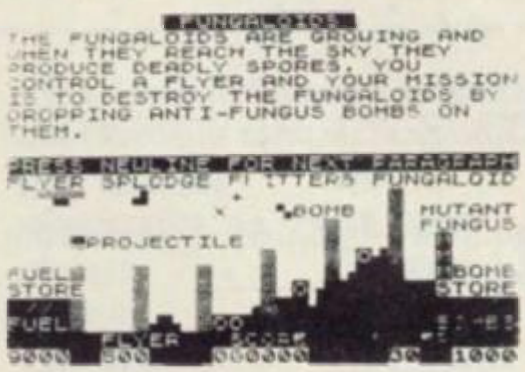
(machine code)





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7 of the 8 games are in machine code, because this is much faster than Basic. (Some of these games were previously available from J. Steadman). Cassette 4 costs £5.

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Searching at routine speed

John Gilbert continues his series of articles by looking at retrieving data

IN THE LAST few months I hope you have learned that programming is not an exact science but an art. There are no best ways to program — there are only guidelines. If you can think of a better way of doing something, or improving established methods, do not be worried by the so-called experts. Experts are not always correct.

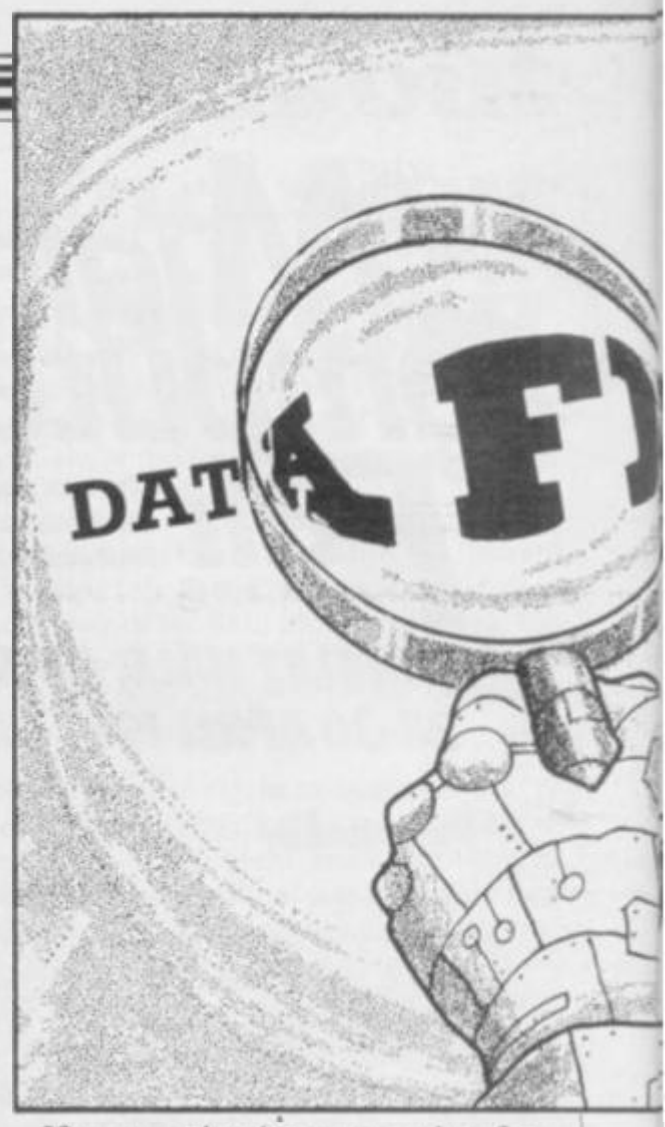
There are many methods of searching data, just as last month we indicated that there is more than one way of sorting data items. No technique is better than another but in the proper circumstances one technique can be used in favour of another. The Binary Search with which I deal is one of the fastest searching routines and one of the easiest to learn.

Obviously, speed is important in any searching routine. Someone cannot wait for an hour for data contained in a list of 30 items to be retrieved by the computer. If that were the case it would be easier to search through a list on paper.

One method of searching a list would simulate a person doing it by hand very well. That is called the Serial Search — figures one and two — which can take up to half an hour to search a list of 100 names and addresses. The listing in figures two and four will run on the Spectrum but multi-statement lines, such as 2030, will have to be eliminated for use on the ZX-81. The routines will run without the database but if you want to include one of them within the main program you use lines 2000 to 2040.

The computer scans the data list, item by item, trying to match the key, a name or telephone number entered by the user, with the items in internal memory. When a match is made the item will be displayed in full on the screen.

The length of time of the process will depend on the speed of the high-level language, such as Basic, or the speed of the central processor if the program is written in machine code. The number of items in the list to be searched will also be a factor in the amount of time taken by the computer.



If you are planning to use only a few data items you could use the Serial Search technique. The coding is simple. Use a variable as a counter to point to each data item in the listing in turn. Increase the pointer by one every time an item is compared to the user's entry and no match is made. When the match is made, print it to the screen.

The Binary Search is as easy to program as the Serial Search but the routine is much faster, as it does not have to search every data item on the list. The data must be sorted in alphabetical or numeric order and the computer will look at the element at the centre of the list of data as the starting-point — figure three — cutting the list into two halves.

If the identification keyword or number, typed-in by the user to trace an item in a file, and the element in the file does not match, the computer has to continue its search. The computer will find if the alphabetic character or number is higher or lower than the keyword typed-in by the user. If it is lower the computer will take the last element examined and make that the end of the file, cutting away the other half.

If it is higher, the computer will take the last examined item as the beginning of the new, shorter file. The computer will then find how many elements are in the short file and divide it by two. The number found will be the element at the middle of the file and that is the element looked at next by the computer.

The process continues until a match is

Figure 1

SEARCH KEYWORD: Sinclair

STAGE ONE:

→ Memory aid
Read Only Memory
Sinclair Research

STAGE TWO:

Memory aid
→ Read Only Memory
Sinclair Research

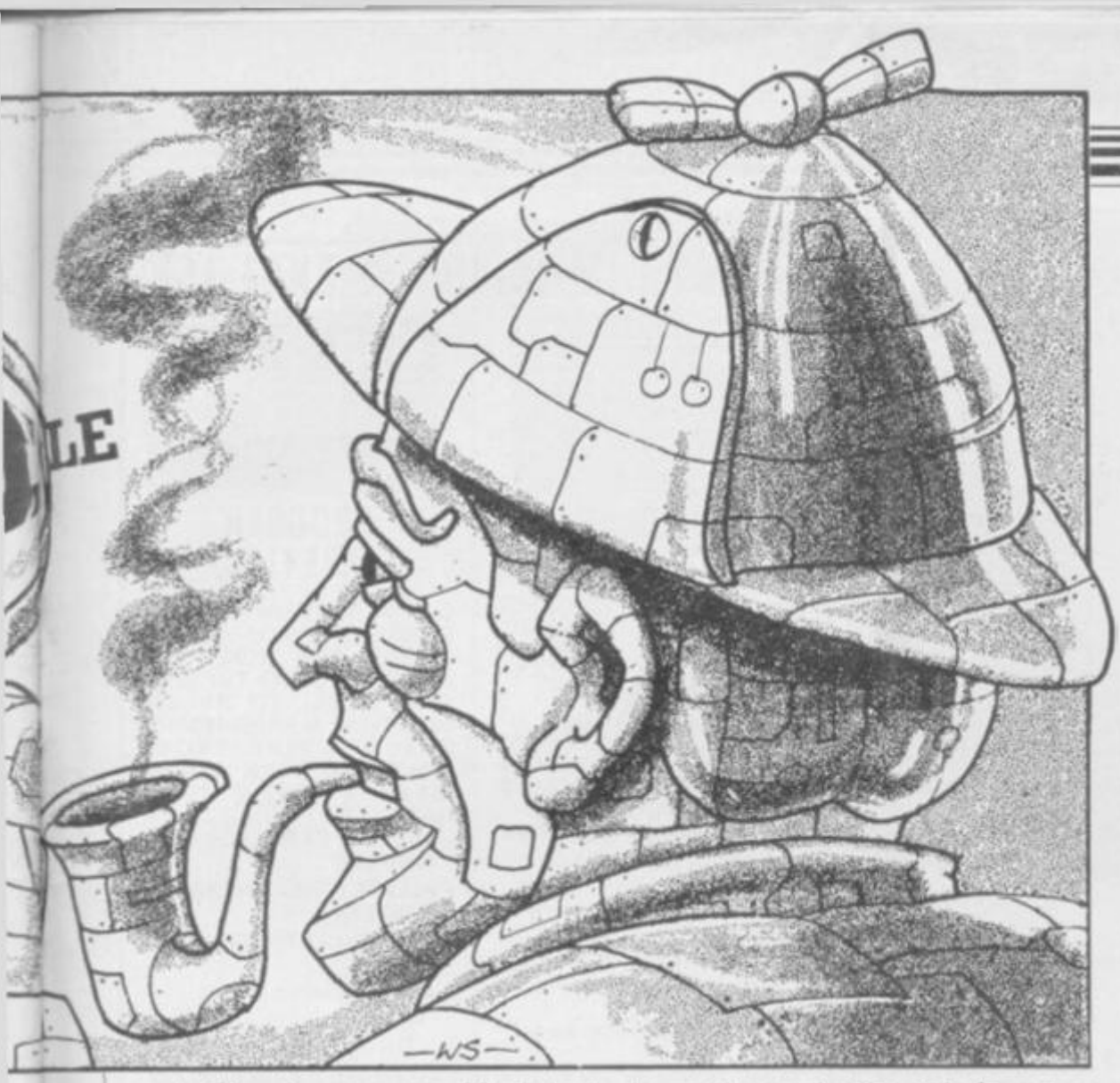
STAGE THREE:

Memory aid
Read Only Memory
→ Sinclair Research

SEARCH COMPLETED

Figure 2

```
2000 DIM b$(10,12): REM SET UP E
XAMPLE DATA FILE
2010 FOR k=1 TO 10
2020 INPUT b$(k): REM DATA FILE
ENTRY
2030 NEXT k: PRINT "FILE ENTRY C
OMPLETE": PAUSE 100: CLS
2040 INPUT a$: REM SEARCH KEYWOR
D
2050 LET a=1: REM a=NUMBER OF FI
LE ELEMENT BEING MATCHED
2060 PRINT AT 10,10; FLASH 1;"SE
ARCHING"
2070 IF b$(a)(1 TO LEN a$)=a$ TH
EN GO TO 2110
2080 IF a=5 THEN GO TO 2100
2090 LET a=a+1: GO TO 2070
2100 PRINT AT 10,10; FLASH 1;a$;
" NOT FOUND": STOP
2110 CLS : PRINT AT 12,0; FLASH
1;"ITEM LOCATED"; FLASH 0,b$(a):
 STOP
```



made. Then the computer will print-out the full data item found in the file. The whole process is shown in figure three and a listing of the resulting program is shown in figure four. The listing can be used alone with a short data entry routine or with the database which has been discussed as an example throughout this series.

The listing in figure two includes a short entry routine so that you can test the speed of the Binary Search. Line 30 of the routine will check to see if the keyword entered at line 25 is the same as the element pointed to by variable L in the data file, b/. If it is less than the value of the file entry, the pointer, L, will move further up the list and if it is greater if will move down the list.

That part of the program is executed in lines 30, 40 and 50. The number of the file element in L must be an integer, so INT is used in those lines. The 0.5 at the end of the lines mentioned must be added to the INTeger in L to round it up and not down, as the Sinclair machines do automatically during mathematical operations.

In some cases it is necessary to display every item in a data file which has an entry which corresponds to the keyword input by the user. That can be done by adding an extra condition, IF ... THEN, statement before line 40 so that if a match occurs the program will continue to search the file in case there are more corresponding items. If a long file of data is to be processed and displayed it is a good idea to introduce paging into the display routine.

A list of data must not turn over the end of the screen so that a 'scroll?' message is displayed. The computer should display the data in pages and at the bottom of each page a message to the user should be displayed asking whether he wants to see more. If the user types-in 'no' the program control can be returned to the main menu.

The display of data is an important facet of any program and the guidelines in the second article of this series apply to data output as well as data entry. When a menu is used in a program and is not displayed for some time while other operations are taking place it is important to let the user know what other options are available at that time. That can best be done by displaying a band across the bottom of the screen with the options and the 'return to main menu' option on it.

The main point I want to stress is that not all users are programmers. That may be less so now than in the past with the advent of home computing but there are still some users who have difficulty even getting around the keyboard.

While it is important to know about techniques for file processing, such as those discussed in this and the previous article, it is more important to know about the user interface, i.e., how the user will interact with the computer and how he will cope with your program. Once you can see the likely reaction of the user and fit the program around your intended user, everything else will seem simple.

Next month, in the final article in this series, I will show how to develop techniques for ridding yourself of those little creatures which users do not see but which can make a hash of a program — the bugs.

Figure 3.

```
SEARCH KEYWORD: Sinclair

STAGE ONE:
            Alphabet
            Bubble
----------> Memory
            Research
            Sinclair
            ZX-81

STAGE TWO:
            Alphabet
            Bubble
            Memory
----------> Research
            Sinclair
            ZX-81

STAGE THREE:
            Alphabet
            Bubble
            Memory
            Research
----------> Sinclair
            ZX-81

SEARCH COMPLETED
```

Figure 4

```
2000 DIM b$(10,12): REM SET UP E
XAMPLE DATA FILE
2010 FOR k=1 TO 10
2020 INPUT b$(k): REM DATA FILE
ENTRY
2030 NEXT K: PRINT "FILE ENTRY C
OMPLETE": PAUSE 100: CLS
2040 INPUT a$: REM SEARCH KEYWOR
D
2050 LET l=INT (5/2)+0.5
2060 IF b$(l)(1 TO LEN a$)=a$ TH
EN PRINT FLASH 1;"ITEM LOCATED "
; FLASH 0;b$(l): STOP
2070 IF b$(l)(1 TO LEN a$)>a$ TH
EN LET l=INT (l/2)+0.5
2080 IF b$(l)(1 TO LEN a$)<a$ TH
EN LET l=INT (l*2)+0.5
2090 GO TO 2060
```

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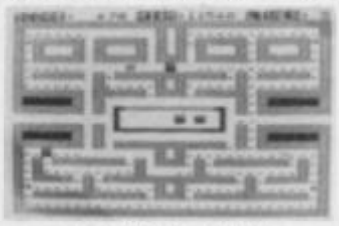

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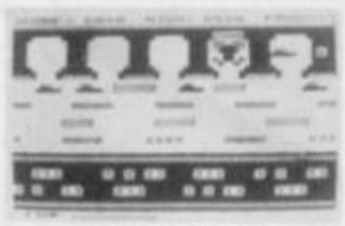

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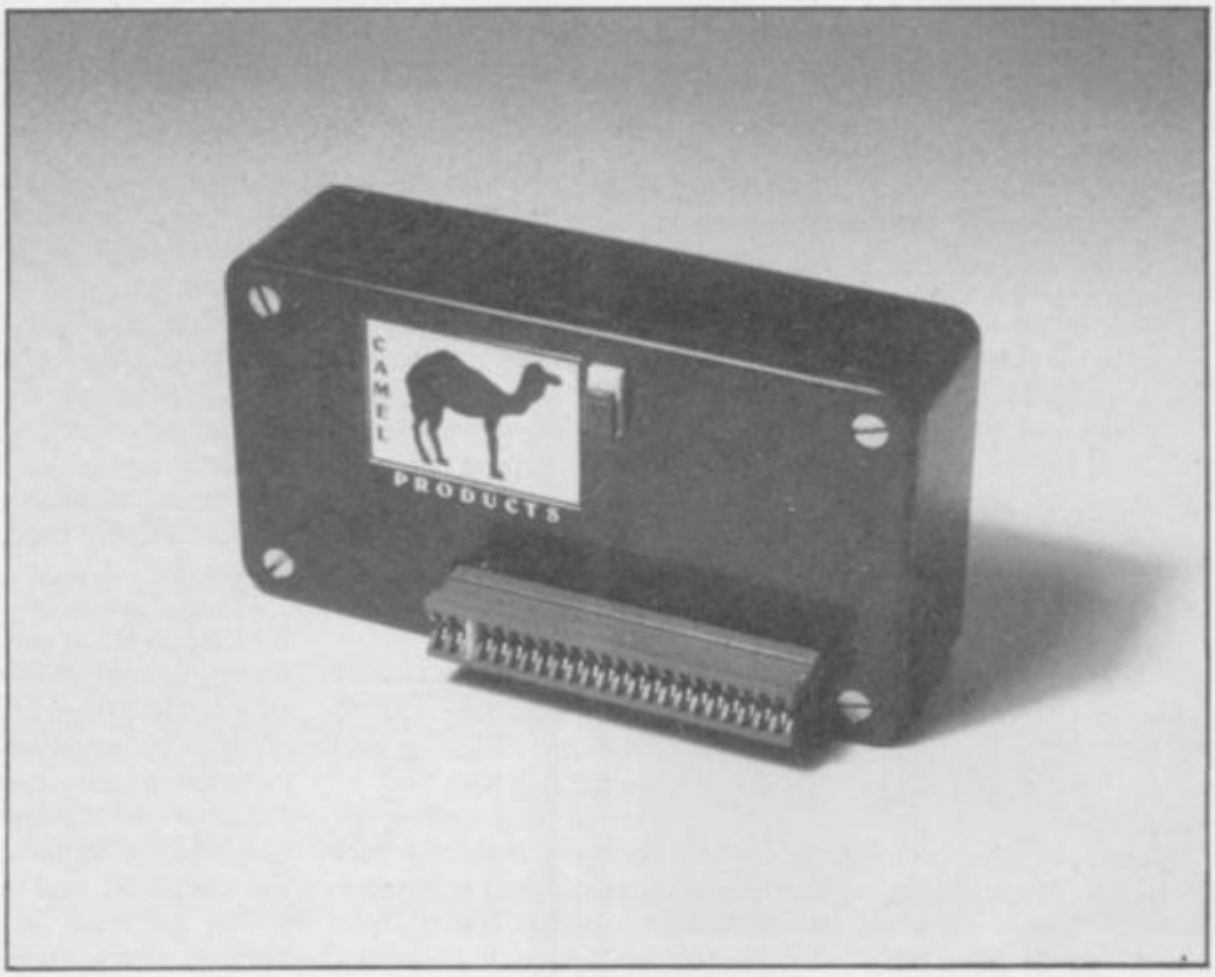

Battery-backed RAM for micros is here at last. Stephen Adams finds it cheap at the price.

Permanent memory from the magic Memic

WITH RECENT developments in battery and memory technology it is possible to keep the memory of a computer intact without having to store it on disc or tape. The Memic 81 is one such system which keeps the memory supplied with sufficient power to preserve its data, even when the power to the computer is turned off. That allows you to have the ease of use of RAM with the permanency of ROM.

The Memic 81.2 contains one or two 2K RAM chips — 6116 CMOS RAM types. That memory is addressed into the ROM reflection area from 8K-16K on the ZX-81 memory map. The address at which each chip appears can be adjusted to any 2K section within that area by two plugs inside the unit.

The RAM chips are made in CMOS and take a very small amount of power when not being addressed or passing data. Being a static memory it also requires no refreshing of the chip every few milliseconds like the dynamic chips used in the Sinclair 16K RAM pack.

It is those two factors which go a long way to making it a non-volatile memory, i.e., it does not lose it data when the power is switched off. The chips still require power to preserve the data, although it is very small.

There is a lithium battery included in the unit which provides a back-up power supply of 3.5V while the power to the computer is switched off. When the computer power is switched on that takes over from the battery, but does not re-charge it, and the RAM can be used to input and output data. While it is under battery operation that cannot be done, as the supply voltage is too low.

Until now battery-backed memory has been very expensive and available only for mainframes or minicomputers. Cambridge Microelectronics is the first to provide battery-backed systems for microcomputers. The Memic 81-2 is in a small black plastic box 4⅔. in x 2⅔in. x 1⅔in. and it plugs into the edge connector before a 16K RAM pack and after the printer. There is a switch on the front of the box which must not be touched until there is power on the computer, as it transfers control from battery to computer-powered operation.

To use the data stored in the RAM pack the switch must be moved up when you see the cursor on the screen. To keep the data intact when switching off the system, push down the switch before pulling out the plug. If you have to re-set the computer at any time, push down the switch first.

When the switch is down the unit effectively is isolated from the computer and other devices can be used in its place. The edge connector is a fairly stiff fit and so no RAM pack wobble should be experienced with the Memic; as the edge

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experienced with the Memic; as the edge connector for the 16K RAM pack or other extension is inside the case, it also looks very neat.

The case has four large slotted screws which allows you to get inside the unit to adjust the address plugs — which can be done when the power is off without affecting the data held in the RAM — to replace the battery. The battery is a long yellow tube which is held securely by two clips and a stricky strip. That, according to Cambridge Electronics, will last approximately 10 years, so you will not need to do it often.

The Memic arrives well-packed and with a detailed description of how to use it, plus listings of programs which are included inside the RAM pack. Inside the RAM pack are two programs, one a machine code loader to transfer the Basic program into a 16K RAM pack and the other a demonstration program which will do the matrix calculations necessary to cost coloured labels.

All that is required is to throw up the switch after seeing the cursor and write PRINT USR 8334 and the program is loaded automatically into the Basic program area, complete with variables if necessary. The machine code routine which does that is listed and explained in the instructions and consists of only 12 bytes. Another 12 bytes of machine code routine is provided so that the RAM pack may be loaded with up to 4K of program, assuming you have 4K in the Memic, or data.

Both routines can be altered to save any part of memory in the RAM pack. The RAM pack can be switched off at any time to protect the program or data from being corrupted or it can be used to store machine code routines for running via the USR command. Being in RAM and not EPROM means that they can be altered and edited by PEEKing and POKEing bytes into the RAM.

> 'Its price puts it well within the reach of the personal and business user'

The time taken to load even a 4K program into memory from the pack takes less than a second and is certainly faster than any tape or disc. It would have been pleasant to see a write-protect switch on the RAM pack, as it would have meant that if you were running a machine code routine in the RAM that it could not be corrupted by crashing the computer.

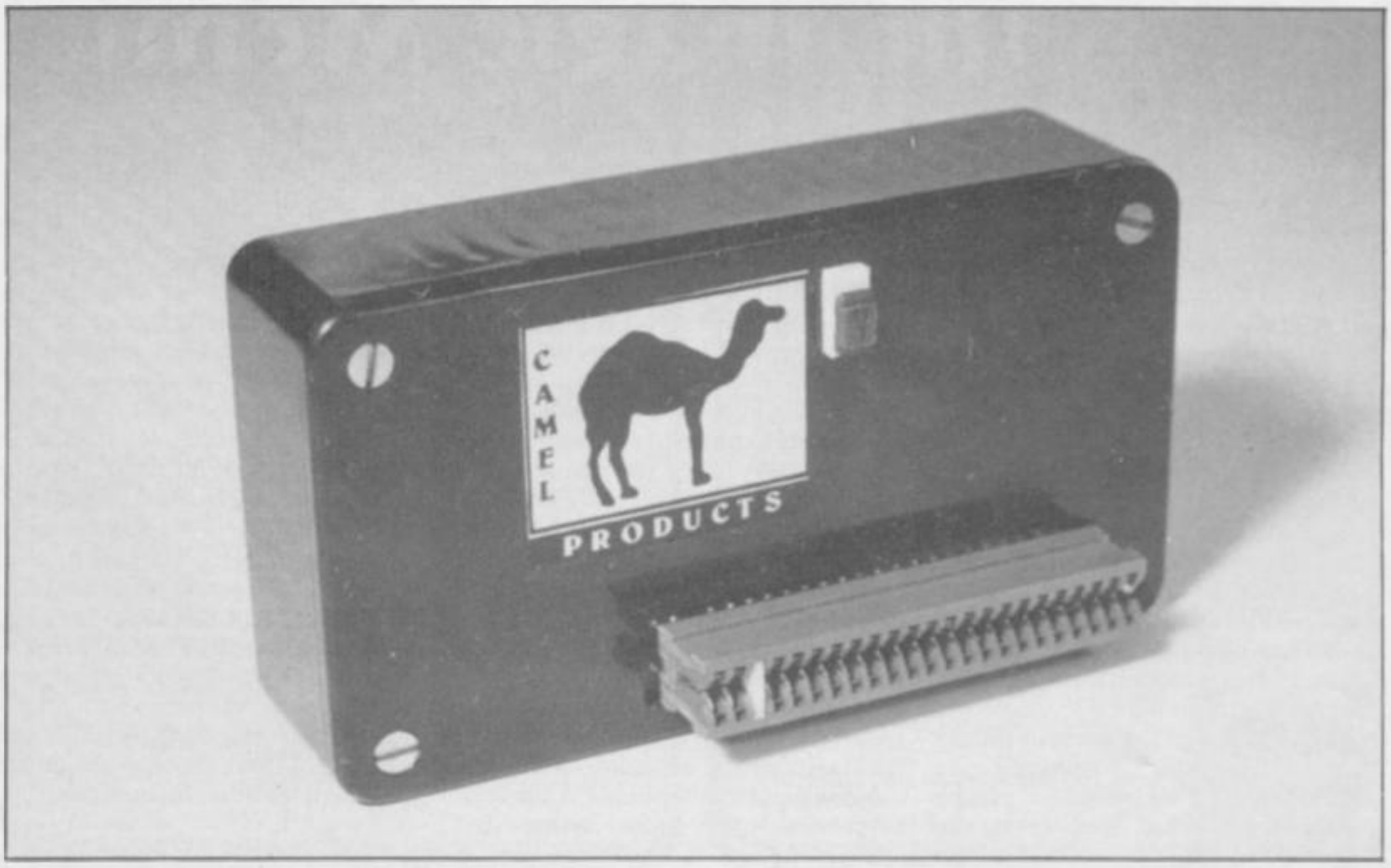
If more memory than 4K is required, Cambridge does a 16K battery-backed RAM pack which is software-switchable, or you could stack together several Memics and switch them on one at a time.

Using this type of RAM pack it can give you portable software, as it can be transferred from one machine to another if the power is turned off before connecting or disconnecting the RAM pack. You can then take the program contained in the RAM pack ready to run and fit it to a friend's machine. Transferring data from the ZX-81 to the Spectrum using this method will work. You must, of course, use a Spectrum adaptor between the RAM pack and the Spectrum.

The unit is very simple and easy to use. Uses for the RAM pack are a quick way of loading a program, storing frequently-used data and frequently-used routines — machine code or Basic — which can be included in your programs.

The life of the battery predicted by Cambridge is fantastic, as it should outlive the ZX-81, and its price puts it well within the reach of the personal and business user of microcomputers.

The Memic 81 with 2K of RAM costs £28.70 and the 4K version £34.45; both prices include the battery and VAT. Cambridge Microelectronics also does other battery-backed RAM for other computers and is at 1 Milton Road, Cambridge CB4 1UY. Tel: 0223 314814.



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Andrew Hewson answers more of your queries and problems

Educational difficulties

A QUESTION often posed by those writing an educational program who have incorporated a number of problems into their program and want to present, say, half of them in one session, is asked by Steven Maltby of Northampton. **How do you tell the ZX-81 to think of five random whole numbers between 1 and 10 without the risk of repetition?**

The obvious answer to his question is a routine of the form:

```
10 DIM A(5)
20 LET A(1)=1+INT(RND*10)
30 PRINT A(1);" ";
40 FOR I=2 TO 5
50 LET R=1+INT(RND10)
60 FOR J=1 TO I-1
70 IF A(J)=R THEN GOTO 50
80 NEXT J
90 LET A(I)=R
100 PRINT A(I);" ";
110 NEXT I
```

Array A is used to store each selection and if a repetition arises it is discarded and a fresh random number is drawn. The routine works well for small samples but becomes progressively slower if the number of samples is increased.

To see the effect, try changing lines 10, 20, 40 and 50 as follows, to simulate the effect of drawing all 52 cards from a pack in random order:

```
10 DIM A(52)
20 LET A(1)=1+INT(RND*52)
40 FOR I=2 TO 52
50 LET R=1+INT(RND*52)
```

Each selection tends to take longer than the previous one because the chance of choosing a number which has appeared previously increases. In choosing the final number, the ZX-81 must select the correct number out of 52 possibilities, which can take a very long time.

A much more elegant solution is to use a routine which mimics the act of shuffling a pack of cards, i.e., create an array containing all 52 possibilities in order and then randomise the location of each element of the array in turn. A suitable routine of this form for Maltby's problem is:

```
10 DIM A(10)
20 FOR I=1 TO 10
30 LET A(I)=I
40 NEXT I
50 FOR I=1 TO 10
60 LET R=1+INT(RND*10)
70 LET S=A(R)
80 LET A(R)=A(I)
90 LET A(I)=S
100 NEXT I
110 FOR I=1 TO 5
120 PRINT A(I)
130 NEXT I
```

Lines 10 to 40 set up the array, lines 50 to 100 swop each element in turn with another element selected at random — the equivalent of shuffling cards — and lines 110 to 130 PRINT the first five elements of the randomised array.

Several readers, including Nicholas Kennedy of Belfast, Geoffrey Hulme of Stoke, and Gareth Rieley of Nottingham, are interested in adding RAM to their

ZX-81s or Spectrums. They ask questions like: **What are the advantages and problems of using a 64K RAM on the ZX-81? Can 16K Spectrum programs be loaded into the 48K machine? Can 16K ZX-81 RAMs be used on the Spectrum? Why is there a difference in price between add-on RAMs for the Model One and Model Two Spectrums?**

In the face of such a barrage I contacted Stephen Adams, who specialises in dismantling Sinclair computers for fun, for the latest information. Most people know that 64K of total memory — i.e., ROM and RAM — is the most which can be used with the Z-80 microprocessor without special paging facilities. In the ZX-81 the bottom 8K of memory is reserved for the ROM — the set of machine code instructions which give the machine its character. In the unexpanded machine the next 8K is absent and then there is 1K of RAM at addresses 16K to 17K.

When a 16K RAM pack is added it displaces the 1K of RAM to occupy addresses 16K to 32K. The implication of that design is that Sinclair intended originally to release a new ROM with enhanced facilities to occupy addresses 0 to 16K.

In fact, it has never done so but other manufacturers have stepped in to fill the gap with graphics units and assemblers; 16K and 32K memories are also available which occupy addresses 16K to 32K and 16K to 48K respectively.

In either case, all the extra memory is available directly to the Basic system; 64K RAMs are available of which 48K lies between addresses 16K and 64K and is available for normal use. Another 8K replaces the "missing" 8K of ROM but that part of memory can be PEEKed and POKEd only from Basic. The final 8K is present but unused, which means presumably that the manufacturer also has some future application in mind.

The memory situation for the Spectrum is equally complicated but for rather different reasons. In this machine the ROM occupies 0 to 16K and the standard 16K RAM occupies the remaining area up to 32K. The easiest way to add more memory is to return the machine to Sinclair with a suitable cheque and it will do the job, but that means doing without your machine for a time.

Add-on memory is available from other manufacturers but Sinclair has redesigned the circuit board completely since its original launch and so it is necessary to determine whether your machine is an early version — model one or a re-designed version — model two.

Most model one machines have grey keys, whereas model two has light blue keys. To be certain which model you have you should look into the machine through the slot in the rear where the edge connector is situated. If you have a 16K model one you will see a vacant 16-pin socket on the printed circuit board lying to the left of the slot and about two centimetres from the rear of the machine. If your machine is a 48K model one the 16-pin socket will not be vacant but will

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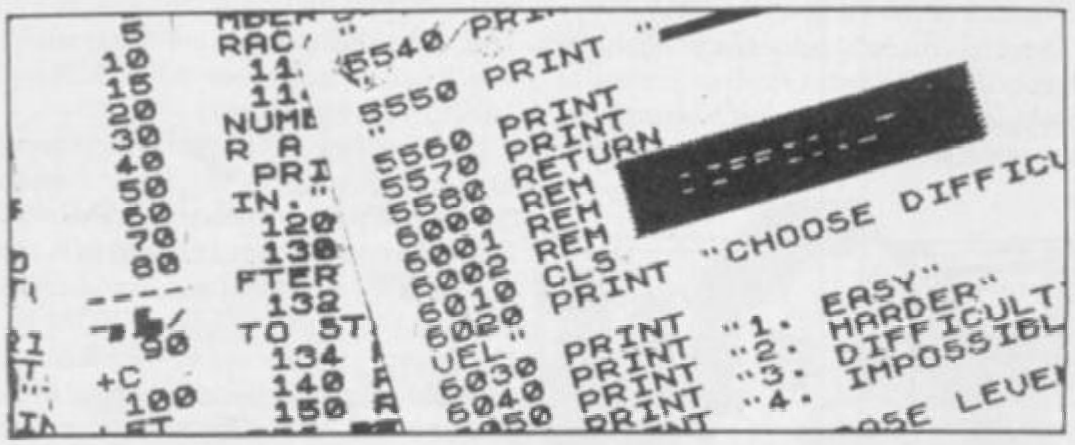
act as the connector between the main printed circuit board and a subsidiary board on which the extra memory and decoding chips are mounted.

In that case you will also see seven circular capacitors, each rather smaller than a halfpenny piece, mounted on the subsidiary board in a line facing the rear of the machine.

The 16-pin socket is not present on the model two because there is space available on the re-designed main printed circuit board for the extra memory and decoding chips. Instead, the very large Z-80 microprocessor chip is clearly visible through the slot, lying approximately below the 9 key on the keyboard.



The reason for the price difference for add-on memory between model one and model two machines is apparent. To extend a model one the necessary chips must be mounted on a suitable board to be located above the main board. To extend a model two the necessary chips need only to inserted in the sockets already provided on the main board.

It is not possible to plug a ZX-81 RAM pack directly into a Spectrum, although at least one company now markets a small adaptor to allow you to do so, thus giving 32K of RAM with a 16K ZX-81 RAM pack or 48K of RAM with a 64K ZX-81 RAM pack.

Programs written for a 16K or 32K Spectrum should work without modification on the 48K machine and it is safe to assume that all 16K programs available commercially will run on the larger machines. Of course, the converse is not true; it is most unlikely that a program written for 48K would function on a smaller machine.

Alan Baker of Fareham asks: **Would you advise using a flexible ribbon connector instead of plugging a RAM pack directly into the user port?**

A ribbon connector can be used provided it is short, say, 3in. or 4in. long. I know several people who have used such a connector to alleviate the well-known ZX-81 wobble problem.

Simon Boyes of Stairbridge has a Spectrum. He asks: **Is it possible to generate multi-coloured single characters?** The simple answer is no. The Spectrum allows one PAPER and one INK colour only per character position. The only way to obtain the illusion of a third colour at a single location is to PRINT first one character and then a second character alternately, using different INK andor PAPER values in each PRINT statement. The following routine illustrates the method:

```
10 PRINT AT 0,0;INK 1;"TTTTTT"
20 PRINT AT 0, 0;INK4;"XXXXXX"
30 GOTO 10
```

The effect is not particularly convincing, because the display appears to blink. If the characters are made to move the eye is distracted from the blinking by the movement. Thus with a little ingenuity characters in different INK colours can be made to appear to occupy the same location and move through one another.

The easiest way to generate the illusion is to rotate user-defined graphics characters bit by bit, rePRINTing the characters after each rotation. Table one shows a machine code routine which rotates the A and B characters to the right and the C and D characters to the left. After eight calls to the routine the A character has been moved to the position occupied previously by B. The B character, in turn, has been moved to the right and then wrapped around to occupy the position previously taken by A.

The second half of the routine works in a similar fashion to move the D character to the left and to wrap around the C character. The routine can be loaded into memory using a loader program such as:

```
10 FOR i=23296 TO 23345
20 INPUT j
30 PRINT i,j
40 POKE i,j
50 NEXT
```

Run the program and enter each of the decimal numbers in the left-hand column

in turn. The machine code routine will be loaded into the printer buffer starting at address 23296. The effect of the routine can be assessed by a loop of the form:

```
10 PAPER 0: BORDER 0
20 CLS
30 PRINT AT 0,0;INK2; "AB AB AB
   AB AB AB AB AB"
40 PRINT AT 0,0;INK4; "CD CD CD
   CD CD CD CD CD"
50 RANDOMISE USR 23296
60 GOTO 30
```

The PRINTed letters, ABCD, must be graphics characters selected by pressing SHIFT 9 at the beginning and end of each string.

● *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*

Table 1 — Routine to rotate A to B and D to C.

Decimal	Assembler	Comment
42, 123, 92	ld hl, (23675)	Point de
84	ld d,h	and hl
93	ld e,l	to A
1, 8, 0	ld bc,8	A and B
9	add hl,bc	
65	ld b,c	
26	ld a,(de)	Next byte
78	ld c,(hl)	of each
203, 47	sra a	Rotate
203, 25	rr c	right
203, 23	rl a	
203, 15	rrc a	
18	ld (de),a	Save bytes
113	ld (hl),c	
19	inc de	
35	inc hl	
16, 240	djnz,-16	Again
84	ld d,h	Point de
93	ld e,l	and hl
1, 8, 0	ld bc,8	to
9	add hl, bc	C and D
65	ld b,c	
26	ld a,(de)	Next byte
78	ld c,(hl)	of each
203, 39	sla a	Rotate
203, 17	rl c	Left
203, 31	rr a	
203, 7	rlc a	
18	ld (de),a	Save bytes
113	ld (hl),c	
19	inc de	
35	inc hl	
16, 240	djnz,-16	Again
201	ret	

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Quentin Heath assesses a re-issued adventure for the Spectrum which is helping to break new ground in developing graphic stories

Trading in galaxies

THE TIME has come to load your ship with cargo and take off for the stars, because this month I want to talk about a space adventure called **Trader.** The game has been around for some time, being distributed quietly by Pixel Productions. Now Quicksilva has re-packaged it and there is a version for the Spectrum available. So I expect we shall be seeing plenty of it in the next few months.

Trader comprises three programs which take you around the known galaxy and, it is to be hoped, back again. Your ship may crash, you may run out of fuel, or it may be stolen — but you stand a good chance of survival. The game includes arcade action but the intellectual abilities of the player are also tested.

The first game lands you on your home base of Epsilon, where you can buy the goods which you hope to trade for profit on other planets. You are told that gold is a useless commodity and has little value, but a certain race of robots find it useful, so you should have some on board.

The game is accompanied by a well-presented information booklet but I would not believe everything it tells you, especially where cargo is concerned. Use your own brain and take nothing for granted.

When you have finished buying goods — and that will demand a good knowledge of the game to do successfully — your ship will transport you to the planet Psi. The creatures there have a very strange business sense, as they want some of your brainwaves in exchange for fuel which you need badly.

To get your vibes they will ask questions and if you answer them all correctly, or almost correctly, you will obtain your fuel. If you do not you will lose your ship.

That part of the game requires a good memory; a calculator is helpful to those who cannot multiply, add, subtract, or divide. With a little forethought you can dispense with the calculator and there is no need to find the answers to the mathematical questions. All you need to do is type-in the question. The Psions are not so clever after all.

The encounter with the Psions shows the type of mental activity needed to play the game. You do not have to be a genius

but you need to be as cunning as J R Ewing.

The planet Beta is the next port of call for your ship, the Pegasus. This time you can do as the instruction book advises, since the inhabitants are skilful traders and they will not stop at theft. So look after your ship or, like me, you could finish cargoless.

Your encounter with the planet Gamma is one of the animated graphics and arcade sequences where it is important to have a good set of digits rather than a brain full of digits. Once you have sucked the raw fuel from the surface of the planet, and if you do not crash in the process, you can continue to the planet Delta.

That planet is dangerous because almost all the humanoid inhabitants are hooked on Booster Spice. That does not, however, prevent them carrying-out criminal acts and the profit you thought you could make on Booster Spice may disappear.

You could also lose your ship and have to search through a maze for it. That part of the game is for arcade buffs, though. Trader seems to have been influenced at the design stage by the Dune trilogy of books from which, I suspect, the idea of Booster Spice was conceived.

Much seems to have been made of the Booster Spice — an illegal narcotic substance on some planets — in the instruction booklet and in the game. It is not until the game ends, however, that you can sell your spice — if you are unlucky. Your business sense will then have to go into over-drive.

One thing of which I would warn fellow-travellers, especially if they are just starting their apprenticeship, is not to BREAK out of any of the programs. If you do so even by accident, you will find that you cannot re-start Trader without loading the other parts of the game again.

The reason is that some of the variables used in the game are placed above RAMTOP so that they can be retrieved by all three programs.

At the time of going to press the Spectrum version of Trader was still being programmed, although from what I have seen of it there are plenty of extra twists in the game and, of course, the graphics are more colourful. The package will be available for the 48K Spectrum and should provide an extended game for mind gamers who like to exercise their laser fingers.

The game is different from other adventure games on the market because it is described as a graphics adventure. There are several available, including **Pimania** and, to some extent, **Black Crystal.** That seems to be the direction in which adventures should go, as graphics, either in the form of animation or static pictures, certainly add variety.

Hints and tips

No need for a calculator or computer.

The Psions will accept the question as an answer.

You may be in trouble if you leave the cargo list to the computer. It is not difficult to make a copy.

You may find that Booster Spice is not as profitable as you are told when dealing with living zombies.

The paradox where cargo is concerned is that theory does not work in practice — sometimes.

• *If you have views on any mind games or if you have hints and tips on adventure games, computer-moderated games, chess, or anything along those lines you can contact me. I will also try to answer any questions which you may have. The address is:*

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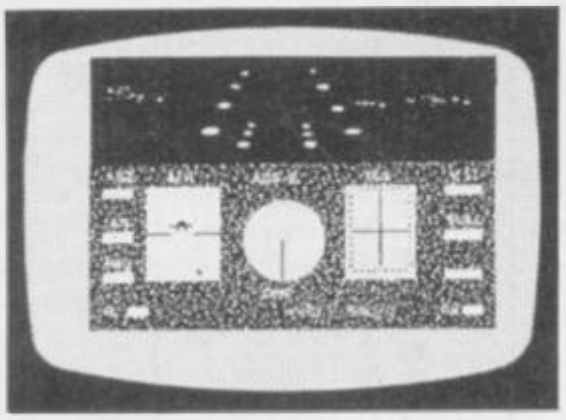

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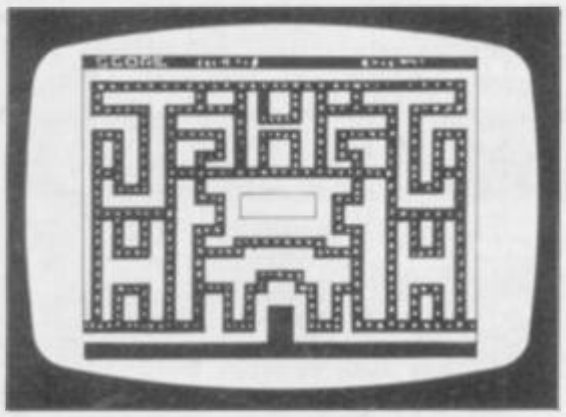

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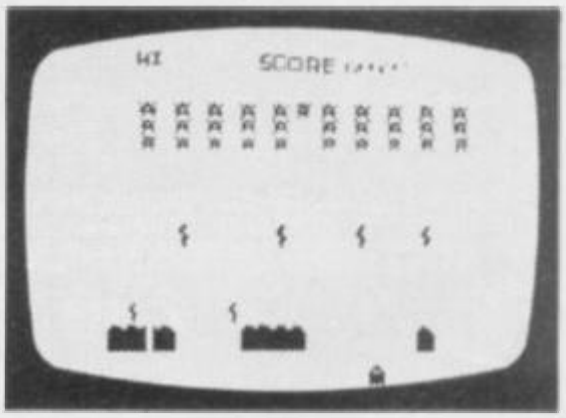

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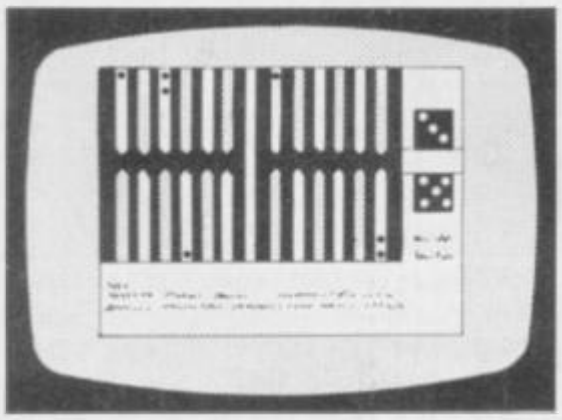

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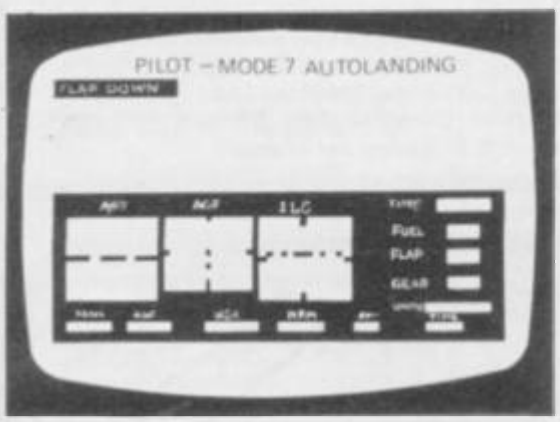

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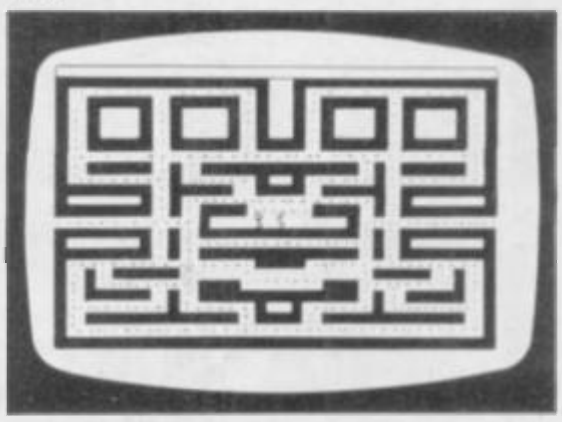

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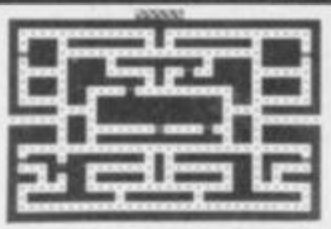

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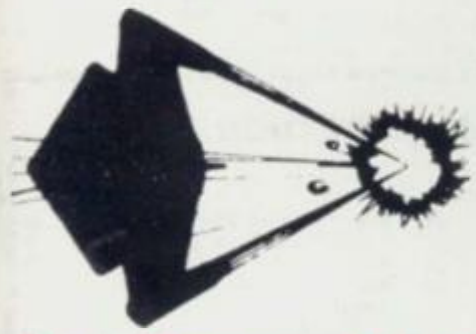

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